FHWA Study Tour for European Intermodal Programs: Planning, Policy, and Technology

FHWA's Scanning Program

U.S. Department of Transportation
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FHWA International Technology Scanning Program

Study Tour Summary Report on

European Intermodal Programs: Planning, Policy, and Technology

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Table of Contents

List of Tables

List of Figures

Executive Summary

Introduction

In September 1993, a team of four government and state transportation association representatives made a two-week scanning trip to Belgium, the Netherlands, and Germany to discuss and report on European experiences with intermodal freight transportation policies and systems. The objective was to observe and document information on European Community (EC) —sometimes referred to as European Union or EU—methods and experiences in the planning and administration, system development, environmental compliance, financing, marketing, and operation of increasingly complex and capital-intensive intermodal freight systems and facilities. To the extent that such information was pertinent to the public and private sector transportation community in the United States, it would be documented in the form of a summary report.

The trip was sponsored and managed by the Transportation Technology Evaluation Center (TTEC) of Loyola College in Baltimore, Maryland, via contractual arrangements with the Office of International Programs of the Federal Highway Administration. Participants included team leader George Schoener, Federal Highway Administration; Otto Sonefeld, Program Director, American Association of State Highway and Transportation Officials; observor Richard Roberts, Chief of Transportation Planning and Policy, the Port Authority of New York and New Jersey; and Gerhardt Muller, Senior Intermodal Strategist of the Interstate Transportation Department of the Port Authority of New York and New Jersey and trip facilitator for TTEC.

In Belgium, the team met with senior officials of the Commission of European Communities-Transport to discuss intermodal freight transportation policy development and programs at the EC level. The team also met with private industry leaders to gain their views on what short- and long-term impacts these policies and programs are having on private sector operations.

In the Netherlands and Germany, the team visited some of the most modern and technologically advanced marine, rail, and highway intermodal terminals. Located in Rotterdam, Bremen, and Cologne, these facilities demonstrated the potential that exists in current intermodal technologies, while pointing out the challenges that the intermodal industry and their customers face. These and other issues were discussed in greater detail at other meetings with national government officials in The Hague and Bonn. At the local government level, meetings were held with transportation officials in Rotterdam, Amsterdam, Hamburg, and Bremen. To gain the private industry's perspectives, meetings with road haulers' representatives and transportation consultants were held in Zoetemeer, with freight forwarders and the chamber of commerce in Hamburg, and with Transfracht officials in Frankfurt. The latter represented at the time a public agency that functioned like a private enterprise.

Background

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) provided a new vision to improve America's transportation of passengers and freight. Its focus was and continues to be on developing and supporting more efficient national and regional intermodal transportation systems and transfer points that reduce congestion, maintain mobility, improve and preserve the environment, and provide for economic development.

ISTEA was also designed to help state and local governments improve their local environment and economy while ensuring that the nation as a whole will have the ability to compete in an ever-evolving global market in the decades to come. This is especially true of the transportation issues that affect cross-border trade between Canada, Mexico, and the United States, as well as emerging trade possibilities with other economic blocs such as Central and South America.

ISTEA provided a clear mandate for addressing intermodal freight transportation. Consequently, considerable attention has been given to developing a greater awareness of freight transportation systems that have the potential to be compatible at critical and highly congested corridors and terminal facilities, and efficient in short- and long-haul carriage.

It is important to recognize, however, that the United States is not alone when it comes to developing and implementing such an ambitious goal. European countries, especially those that belong to the EC, have for several years recognized a similar need to improve economic, environmental, and social conditions within the community through a strong, integrated transportation system. Not only were these social, economic, and environmental issues the driving forces behind the need to harmonize passenger and freight transportation, they had the additional challenge of wide cultural and economic diversity within the Community itself and with the Community's trading partners, regardless of geographic proximity.

In the process of formulating and implementing EC and national intermodal policies and systems—a process which is still developing—the Europeans are gaining valuable experiences and lessons. Some have the potential to serve as approaches to similar circumstances and needs here in the United States. Other lessons and experiences serve as a frame of reference in which the United States could better deal with Europe and other trading blocs, as trading patterns and technologies change.

To look further at what the Europeans have done thus far with freight intermodalism and to establish closer working relationships with European government and private sector counterparts, a small team of federal and state association representatives traveled to Belgium, the Netherlands, and Germany in September 11 - 25, 1993. The team's mandate from the Federal Highway Administration was to scan European experiences in intermodal freight policy planning and administration. Furthermore, the trip was designed to learn more about their planning and development process (including research), environmental compliance, financing, marketing, and operation of European intermodal freight systems and facilities. Information obtained was to be

analyzed and shared with public and private organizations in the United States to assist them in implementing the requirements of intermodal freight policies and programs.

Goals and Objectives

Specifically, the team had the following goals and objectives:

1. Define the process and, in certain cases, obtain detailed information on **how existing and emerging European intermodal transportation policies, systems, technologies, and facilities are developed and implemented**.

   Determine which of these have **potential application, and/or offer examples for the United States**, under similar intermodal transportation development circumstances and issues.

2. Understand in greater detail the **working relationship between the private sector and government** (local, regional, national, and the EC) in the development and implementation of intermodal transportation policies and projects.

3. **Evaluate how conflicting issues were resolved** during the development and implementation of EC policies and regulations affecting intermodal transportation. Items to be examined include the relationship between local, national, European community-wide and international actions as they relate to regional, state, national, and NAFTA issues in the United States.

4. Examine in greater detail how **issues such as environmental concerns and energy conservation, physical and operational constraints, and economic development goals helped shape policy development in intermodal transportation**.

   In addition, explore the relationship of these transportation system issues with European **professional training and education practices**, including internships and apprenticeship programs.

5. Determine how the EC's **intermodal policies and projects**, both short- and long-term, are **adhered to and monitored at different levels of government** (local, state, national) and by the private sector.

6. Examine **mechanisms for resolving differing interests** of the individual transportation modes in establishing an efficient intermodal system, including those in operation now and in the future.

7. **Develop a report of the findings, conclusions, and recommendations** for use by Department of Transportation and other state and local government agencies and relevant national associations, and the private sector. Presentations of these efforts will be made

to the Transportation Research Board (TRB), American Association of State Highways and Transportation Officials (AASHTO) committees, and other organizations, as appropriate.

In preparation for the planned meetings and site visits, a questionnaire was prepared and sent in advance to people in Europe who were to be visited (see Appendix III). The objective was to gain the maximum advantage of the relatively short time scheduled for each of the approximately 50 meetings planned once the team arrived in Europe. (See Appendix I and II for detailed description of itinerary, organizations, and individuals visited.)

The team's mode of transportation within Europe was rail. The objective was to gain additional insight on how the Europeans use rail passenger operations to reduce the amount of traffic both in the air and on the highways, and how efficiently rail interfaces with the other modes at major intermodal terminals. Travel also included the local use of automobile and trolley systems, as well as a van trip on the German autobahn.

Other Objectives

The European Intermodal Policy Review scanning trip also had other short- and long-term objectives:

- Assess the potential for European counterparts to visit the United States to continue the exchange of ideas and experiences.
- Identify EC systems and technologies—existing and emerging—that have the potential of being used in total or in part here in the United States.
- Prepare and disseminate a short summary report of the scanning trip's observations, conclusions, and recommendations.
- Establish contacts and working relationships for long-term international intermodal systems and facilities outreach and technology exchange. This includes transportation ministries, port and airport authorities, technical associations, universities, specialized contracting groups, and private consultants. Appropriate members of the international community will be solicited for interest in future United States technical committee memberships.

Overall Observations

A vast amount of material and information was gathered on this scanning trip, and we strongly urge the reader to study the chapters concerning the EC, the Netherlands, and Germany for specific details and a better understanding of each country. Nevertheless, there were several important general observations and conclusions that emerged after considerable team discussion and analysis.

1. **Intermodal freight planning and policy is truly in place at both the pan-European and national levels.**

Despite tremendously challenging cultural and national differences, European intermodal freight transportation policy planning and program development involves a process that in general is mutually supportive at all levels of government. Such programs are focused to gain the maximum benefit for regional and pan-European economic, social, and environmental needs.

In contrast to the United States, where most of the public sector intermodal focus is on passenger-related intermodalism, the Europeans are well into the process of balancing both passenger and freight transportation needs together with the environment as the focus of attention. This creates the need for more discussion of freight intermodal alternatives, especially where transportation congestion along major highways causes environmental harm to surrounding areas.

2. **Shorter distances force innovative intermodal system solutions.**

With an average of 300 to 500 kilometer (186 to 310 mile) trip lengths, freight transportation distances are much shorter in Europe than in the United States and do not easily benefit from economies of scale and distance. As a result, many European intermodal transportation policies and programs require very innovative thinking to take advantage of distinctive modal characteristics and peculiarities, especially when considering traffic congestion and environmental constraints. Examples include greater emphasis on railroad, short sea shipping (better known in the United States as coastal shipping), and inland waterways to relieve highway congestion and pollution.

3. **The planning process involves distinct public/private interaction and dialogue.**

Relationships between European intermodal interests are slowly, but successfully evolving, especially with freight transportation. Recognizing that some issues are still the focus of very serious differences of opinion, a sense of working together, through dialogue, is beginning to give freight transportation a larger role in the overall needs of the national and EC infrastructure development.

4. **Government funding is available for all modes.**

Recognizing that the larger economic, social, and environmental issues are the driving forces behind passenger and freight transportation, public funds from the EC to member governments are provided for intermodal infrastructure as incentives for the private sector to shift more of its transportation needs from modal to intermodal systems. Within the member governments, funding is provided to the most cost-effective transportation investment, regardless of mode.

5. **Environmental concerns heavily influence transportation policy.**

Environmental concerns are clearly a significant, if not the most significant, factor driving transportation policies and investment decisions. Environmental constraints and "quality of life" issues have directed more attention to the better use of the rail and water modes, as well as better intermodal connections.

Sustainable mobility—an optimum transportation system developed within social and environmental constraints—has become the guiding principle for transportation policies at the EC level and within many of the member countries.

6. **Pricing/cost structure is key to realizing full intermodal integration.**

Rail, highway, water, and air modes have reached the point in the planning process where to a large extent they are seen as equal members. This is especially true where there is the clear need to link the modes to the existing and emerging demands of commercial activity. Each mode must pay its fair share in all respects. Such policies, although still a long way from the ideal, encourage intermodal policy and infrastructure development that is supported in part by a pricing system that recognizes both direct and indirect environmental costs of the various modes.

7. **Efficient freight transportation requires planning at European and national levels**.

In addition to the need to address internal problems of congestion, environment, and economics, there is a strong feeling at the EC and most national levels that failure to develop a compatible, equitable, and efficient intermodal transport system will result in an unacceptable loss of world market share. As a result, intermodal policy and facility plans have been developed at the EC and national levels to provide for efficient freight transportation.

8. **Governments share risk with private sector.**

Many of the more innovative intermodal systems and facilities are considered high-risk investments given their market and modal uncertainties. To overcome this risk factor, public and private entities agree to share such investments. For the public sector, the payoff is return on taxes and other forms of employment benefits. For the private sector, successful operations often help involved companies maintain a competitive edge within the marketplace at greatly reduced financial exposure. Such risk taking has seen some degree of success.

9. **Trans-European networks for all surface modes and air provide the framework for investment.**

These networks, developed for both modal and intermodal systems, provide a focus for limited EC transportation investments that support European economic development. The networks also provide member countries, local governments, and the private sector with a framework for their investment actions. Furthermore, these networks establish a common level of standards for infrastructure, equipment, and operations and provide a flexible tool for ensuring that the EC investment is part of an overall transportation strategy providing stimulus for the financing of projects by the private sector. All modes are included in this overall framework for an intermodal transportation system, as the Europeans are seeking to optimize the potential of each transportation mode.

10. **Governments recognize freight transportation's role in economic competitiveness.**

Recognition of the importance of freight transportation in supporting economic growth is clearly present at all levels of government. Many of these governments are struggling to change from traditional to newer business activities and technologies. Governments at both the EC and national levels are supporting intermodal freight transportation infrastructure improvements that link economic regions through coordinated transportation, environmental, and commercial policies and projects. Existing duplicative transportation between regions is generally recognized as no longer acceptable.

11. **The need to share intermodal technology and standards is recognized.**

Because of differences in intermodal equipment and technology standards between EC countries, the EC has established projects like SIMET (Smart InterModal European Transfer) that are designed to develop and help implement common standards and specifications for intermodal yards, including rail, highway, maritime, and inland waterways. Such harmonizing of standards is designed to accelerate improved operating efficiencies by sharing information and innovative technological developments.

Recommendations

Although the team has digested a huge amount of oral and written information and discussed our own observations in detail, it is recognized that considerable additional study should be given to this subject before adopting any European policies without qualifications. In particular, this would include in-depth comparisons between United States and European policies and practices regarding ownership and/or de facto subsidizing of all the modes—and the consequences of changing these patterns as reflected in current policy of all the EC nations. Nevertheless, there are still a few conclusions we have drawn from this exercise

which should be seriously considered by United States policy makers as we approach a new century. We suggest:

1. **The United States could benefit by identifying transportation infrastructure networks which are of "national" interest.** This would help focus the nation's limited transportation resources on policies and projects that maximize transportation efficiencies of each mode to improve economic competitiveness throughout the nation. The National Highway System (NHS) and National Transportation System (NTS) are significant efforts that are under way which support this recommendation.

2. **The United States should consider more innovative and focused funding mechanism policies for intermodal freight transportation (rail, highway, inland and coastal waterways, air) fundamental to our country's ability to improve our efficiency and compete internationally.** This includes government's participation and facilitation of innovative intermodal investments that require longer-term risk-taking. Efforts such as the formation of the Innovative Financing Task Force by the FHWA and its proposed test and evaluation projects are positive steps toward addressing this recommendation.

3. **Transportation planning organizations, including federal, state, and local planning organizations, could benefit from inviting and continuing discussions with European intermodal policy decision makers. These meetings would concentrate primarily on intermodal freight transportation policy development and the process by which such policies could be linked internationally.** This should include visits to major international airports and seaports, major rail lines, and passenger and freight corridors like the Northeast and Alameda Corridors—projects that exemplify American intermodal concepts and technology. Discussions with American transportation decision makers should include issues such as regional mobility, long-range planning, and project funding.

4. **Conversely, there is the need for American transportation government officials to visit other countries, especially those countries that are important trading partners with the United States, to become better informed about their intermodal transportation policies and programs.** In the team's opinion, meeting with European counterparts and visiting innovative intermodal freight transportation facilities has immensely enhanced the scope and appreciation of potential United States applications.

In closing this section of the report, we again urge the reader to continue to the more detailed descriptions and explanations of policies within the EC, the Netherlands, and Germany.

1. Summary Report on the European Community

1.1 Background

The transportation policies being pursued by the European Community are very similar to those articulated in the United States' Intermodal Surface Transportation Efficiency Act of 1991. While there are obvious differences in political structure and geography, the common goal of efficient, integrated surface transportation systems provides a good basis for sharing ideas on research and technology advancements and experiences in implementing intermodal systems. Before discussing the transportation policies of the EC and identifying opportunities for collaboration with the United States, some background on the EC is provided.

The EC was created to provide a framework for a closer union of the European countries, in economic, social, and political terms. The founding members of what was then called the European Community, who signed the Treaty of Rome in 1957, are Belgium, Germany, France, Italy, Luxembourg, and the Netherlands. The United Kingdom, Ireland, and Denmark joined in 1973, Greece in 1981, and Spain and Portugal in 1986 (see Figure 1: Map of the European Community). With the introduction of the Maastricht Treaty in 1992, all borders between member states disappeared and people, goods, services, and capital can circulate free of internal barriers.

The EC is run by four institutions, representing the executive and legislative branches of government and the judiciary. These institutions are (1) the Council of Ministers, made up of representatives of member states; (2) the European Commission, the main executive institution; (3) the European Parliament; and (4) the European Court of Justice. The ministers who sit in the Council are directly responsible for their national governments. The European Parliament is directly elected by EC citizens. The president and the 16 other members of the European Commission are nominated by their governments and approved by the Council of Ministers. Legislation is introduced by the Commission, with the Council of Ministers' and the Parliament's approval required before it becomes law.

The transportation situation in the EC is not too different from that in the United States. The EC has seen significant growth in transportation (2.3 percent per year in freight and 3.1 percent for passengers between 1970 and 1990), while the investment in infrastructure has declined (1.5 percent of GDP in 1975 to about 1 percent in the 1980s). Demand is expected to increase about 25-30 percent between now and the year 2000, resulting in a shortfall in the level of infrastructure needed to meet the demand. Further, about 70 percent of freight is carried on the highways, with 15 percent by rail, 9 percent by inland waterways, and 6 percent by pipelines (see Figure 2: EC Freight Transport by Mode).

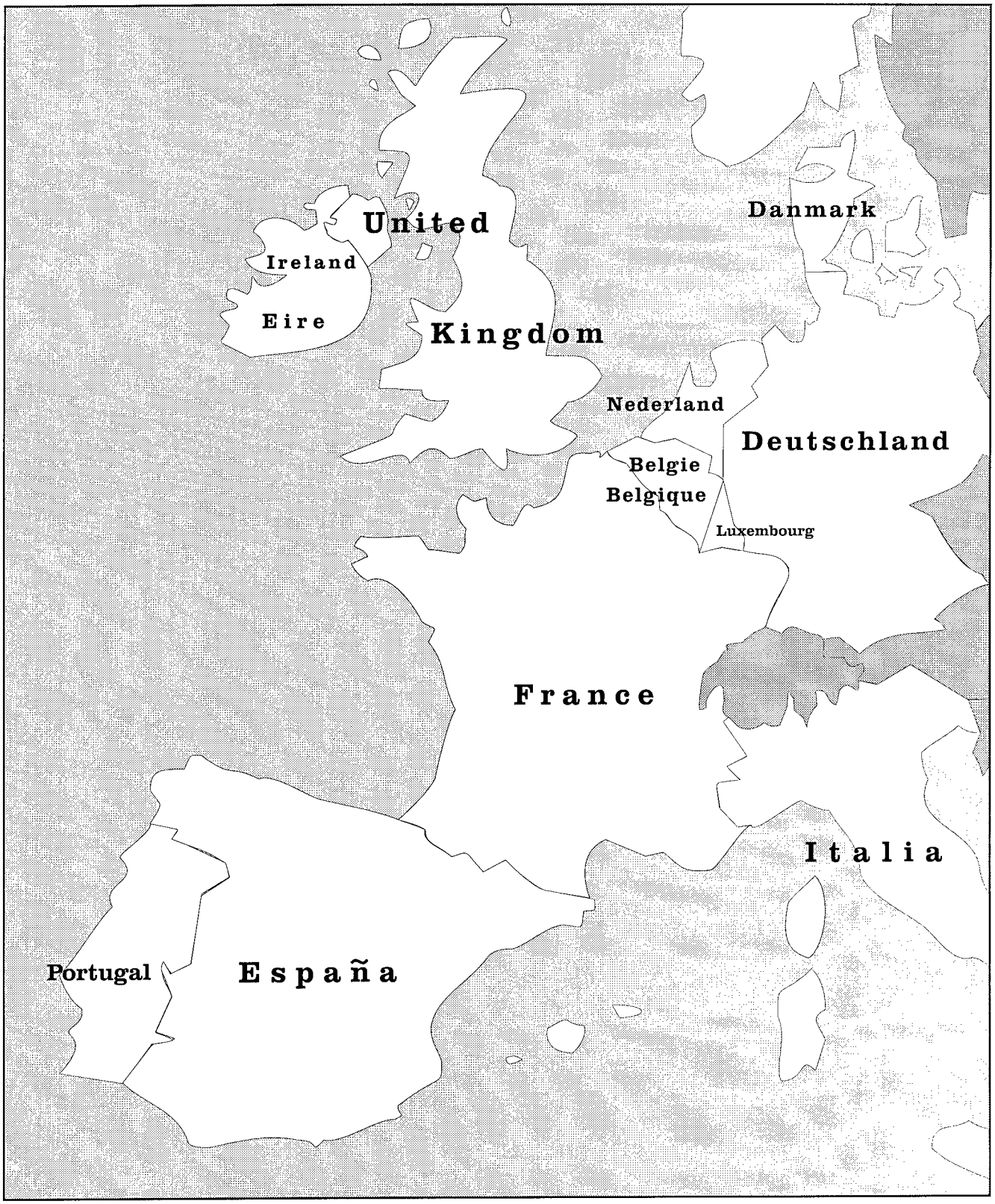
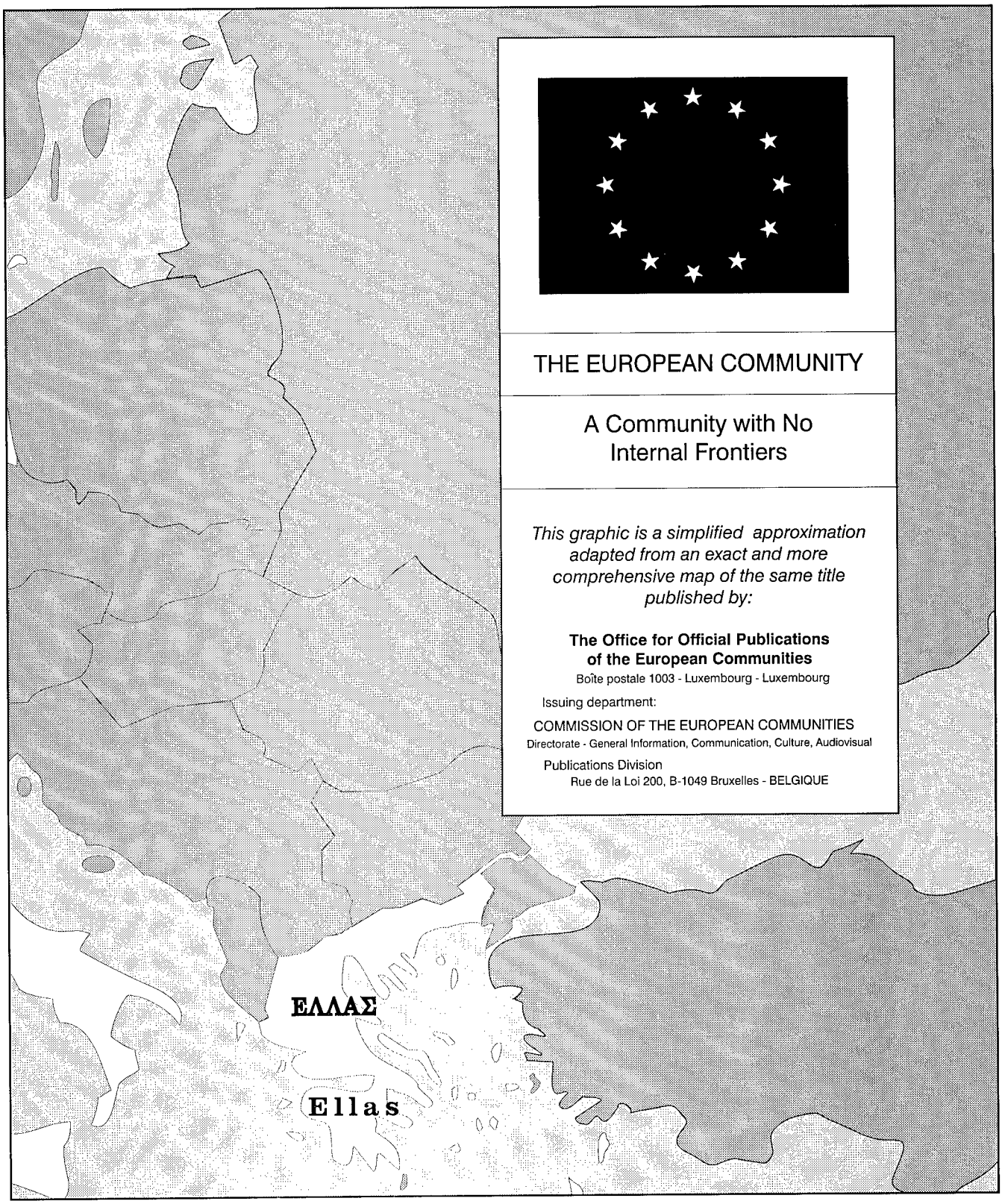


Figure 1: Map of the European Community



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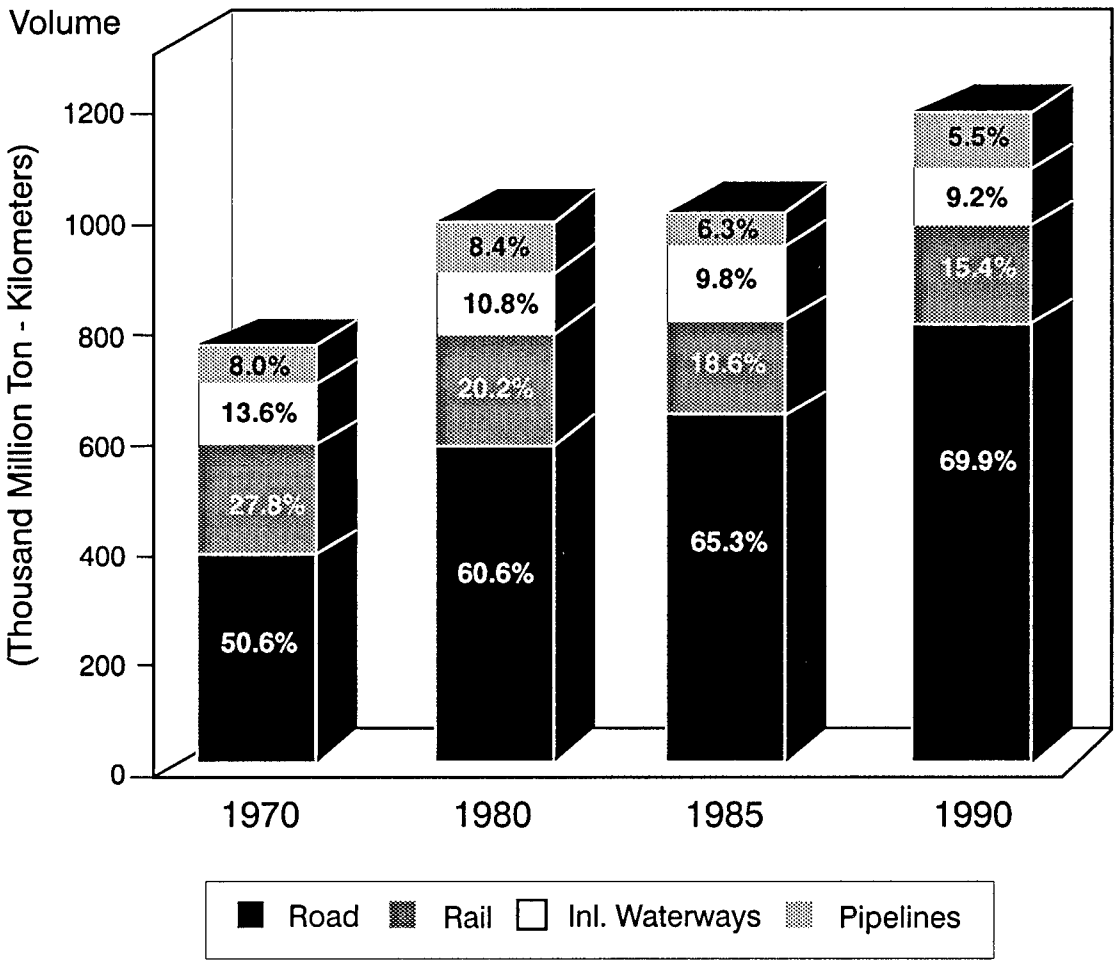


Figure 2: EC Freight Transport by Mode

Reprinted, with permission, from the Commission of the European Communities, "The Future Development of the Common Transport Policy," Brussels, December 2, 1992.

Combined transport (truck/rail) accounts for less than 4 percent. While road transportation is clearly the predominant mode, the following factors are influencing the transportation policies of the EC:

- Current highway congestion and projected growth in road traffic.
- Increasing cost of new road infrastructure.
- Density of population in the northwest part of the EC.
- Pressure of the environmental lobby.
- Unused capacity in the rail and waterways.

1.2 Common Transport Policy (CTP)

Transportation has always been seen as a critical element in linking Europe, and the Treaty of Rome (1957) explicitly recognized this and called for the development of a common transport policy. The 1992 Maastricht Treaty further strengthened the recognition of the vital role of transportation in moving toward an economic union and required the development of trans-European networks. In late 1992, the EC officially adopted a "White Paper on The Future Development of the Common Transport Policy." While not having the force of law, the "White Paper" sets forth the framework for the development of future regulations and directives in the EC. A discussion of the CTP is important because it points out many of the similarities in transportation policy between the EC and the United States.

The CTP recognizes the problems created by the growth in transportation demand and the need for an integrated multimodal transportation solution. The guiding principle of the policy is "sustainable mobility," which attempts to achieve an optimum transportation system while recognizing social and environmental constraints. The primary objectives of the CTP are as follows:

- Strengthening of the internal market through transportation by guaranteeing maximum openness and competition.

- Developing integrated transportation systems for the Community as a whole, with particular emphasis on combining several modes of transportation, with better connections between modes.

- Improving links between peripheral and central regions within the community, developing trans-European networks to connect with national networks.

- Introducing transportation systems which better respect the environment, using charges and fiscal incentives to effect demand for more environmentally friendly means of transportation.

- Strengthening the external dimension of the CTP in relations with countries in Central and Eastern Europe.

As noted above, a critical objective of the CTP is developing integrated transportation systems, with particular emphasis on better connections between modes. To meet this objective, policies and actions are directed toward promoting the combined use of different modes (e.g., rail/sea, rail/inland waterway, truck/rail).

The first major policy area being pursued by the EC to encourage more integrated transportation is to establish a level playing field within and across modes. As part of this effort, much emphasis is now being placed on establishing consistent, community-wide taxation and charging principles for heavy goods transported by road. In addition to looking at excise duties on diesel fuel and vehicle taxes, serious consideration is being given to charging users infrastructure costs that incorporate external costs (i.e., environmental costs, accident costs, and traffic congestion costs). The "internalization of external costs" concept is thought to be necessary to encourage more use of combined transport, as well as to support the development of a sustainable transportation system. The importance placed on the environment will be a strong driving force toward the implementation of some form of pricing that incorporates external costs.

1.3 Trans-European Networks

A second major policy area is the development of trans-European networks, with the aim of establishing interconnections between the infrastructure of the different modes of transportation. Trans-European networks have been developed for high-speed trains, highways, combined transport (truck/rail), and inland waterways (see Figures 3, 4, 5, and 6). While separate networks exist for rail, inland waterways, and highways, the next step for the EC is to integrate these networks into a trans-European transportation system. These efforts are now underway, with much of the EC research budget being devoted to developing procedures to assist in creating an integrated transportation system.

The highway network is focused on the connection with the national networks through the construction of missing links and upgrading of existing links. In addition, standards and traffic management policies are being developed to insure consistent operations across these networks. The plan for the highway network calls for about 54,0000 km (33,750 miles) by the year 2002, with about 12,000 km (7,500 miles) yet to be built.

The combined transport network was initially established to provide a framework for a road/rail-based transportation system for diverting freight from the congested road network. At the outset, the development of the network involved the identification of traffic flows by road that, due to their volume or distance (generally greater than 400 km or 250 miles), offered the greatest potential for cost-effective intermodal movements. A total investment of about 2 billion ECU[1] (in 1991 European prices) is required to complete the basic network, which includes some equipment purchase and terminal expansion (this cost estimate is only

[1] The ECU (European Currency Unit) is a weighted unit of currency based on value of currency exchange and other financial considerations of the member nations of the EC. On average in 1993, the exchange rate was 1.13 ECUs to one U.S. dollar.

investments required to serve international traffic). It is estimated that this investment will result in a doubling of existing traffic (from about 4 percent to 8 percent of the freight market share). To achieve further traffic increases, new lines of capacity may be needed; however, this may be reduced as construction of the high-speed rail passenger system frees up existing rail capacity. The network would be constructed by a joint effort between the railways, the member states, and the EC (using the Infrastructure and Cohesion funds).

A network of inland waterways was developed on the basis of an economic and technical analysis of the existing waterway capacity to provide cost-effective service for containers and swapbodies. Though not extensive, possibilities exist to expand its coverage. What seems important here is that the combined transport network was broadened recently to include inland waterways, an area that may offer potential in the United States.

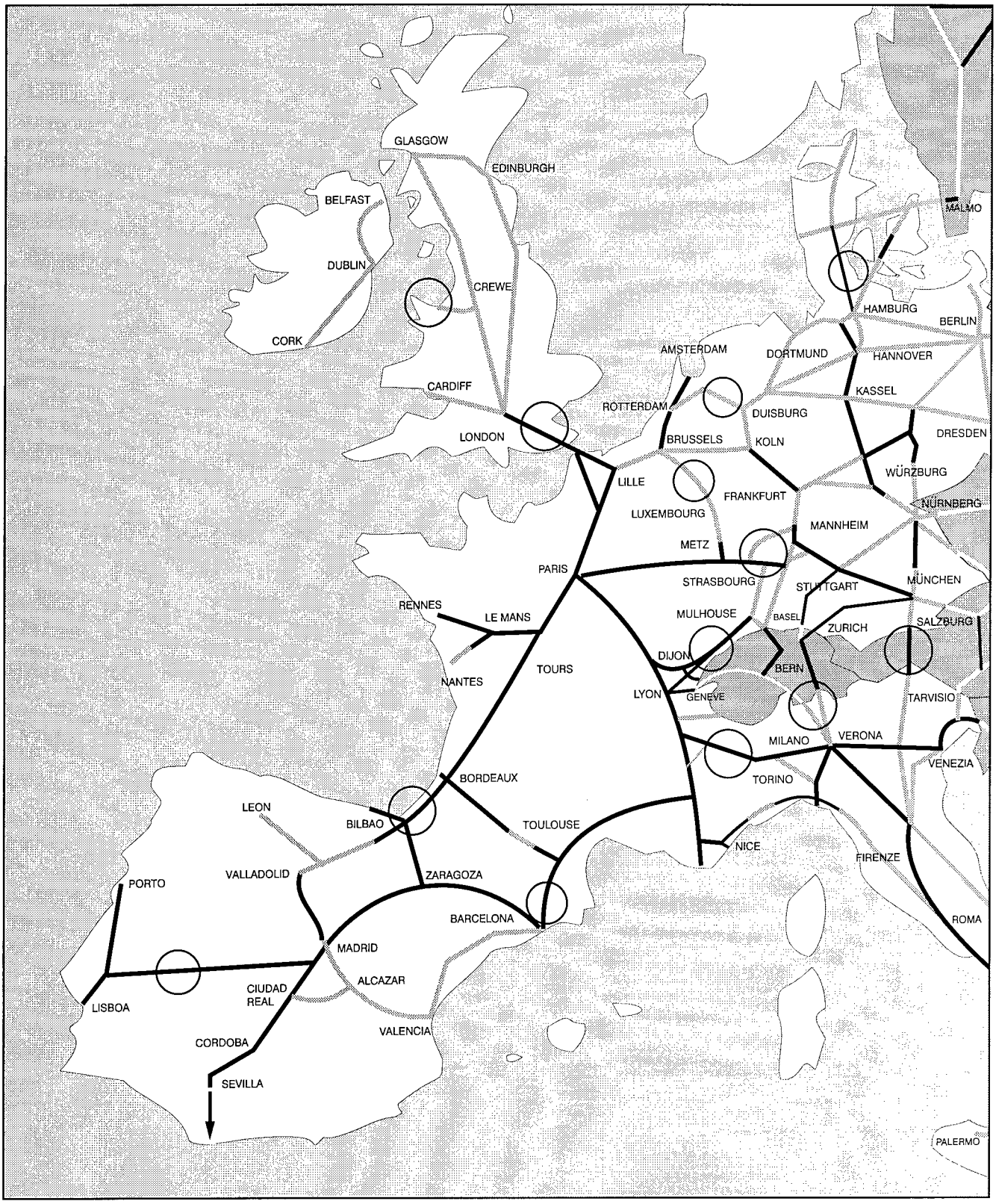
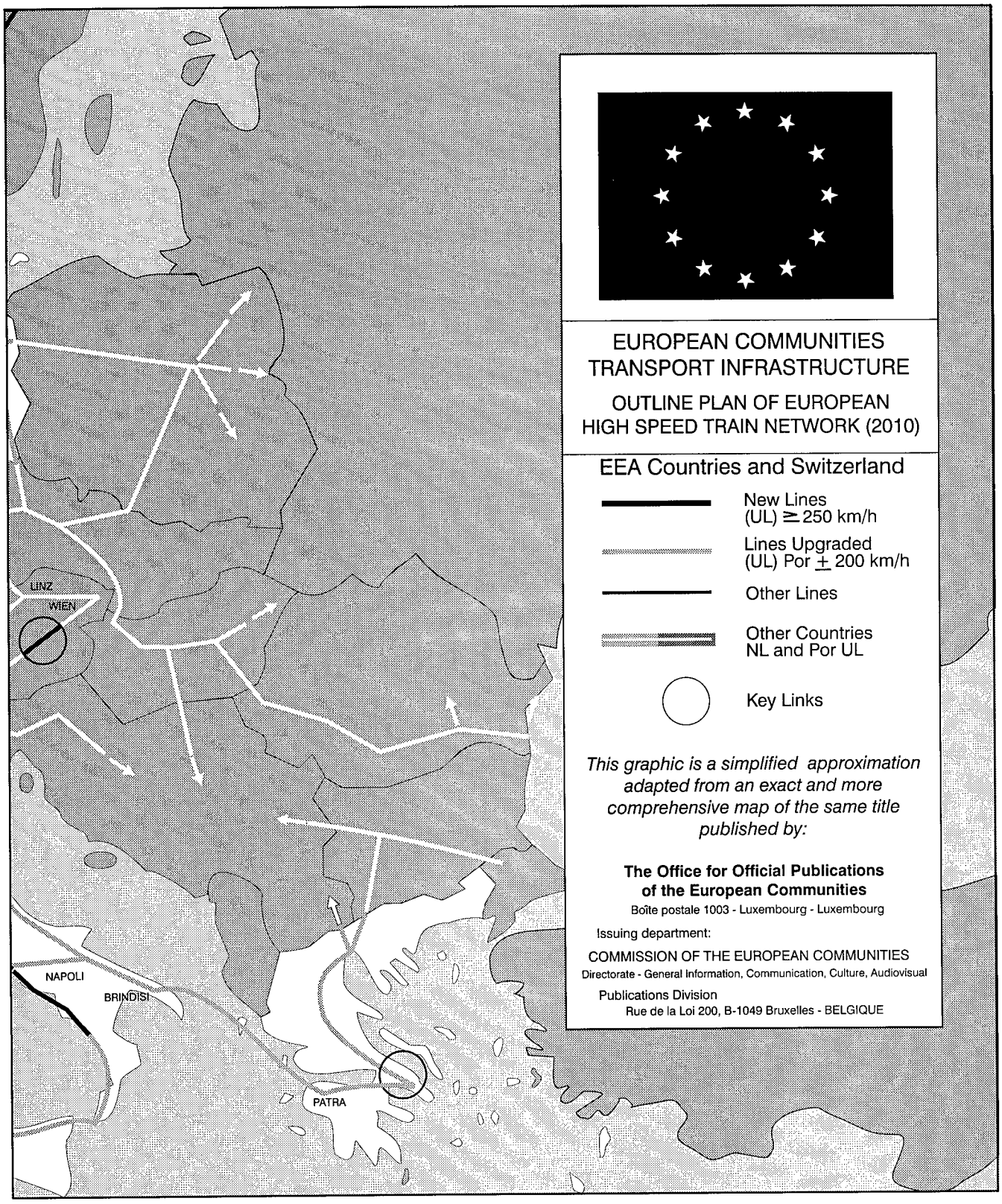


Figure 3: Trans-European Networks—High Speed Train Network



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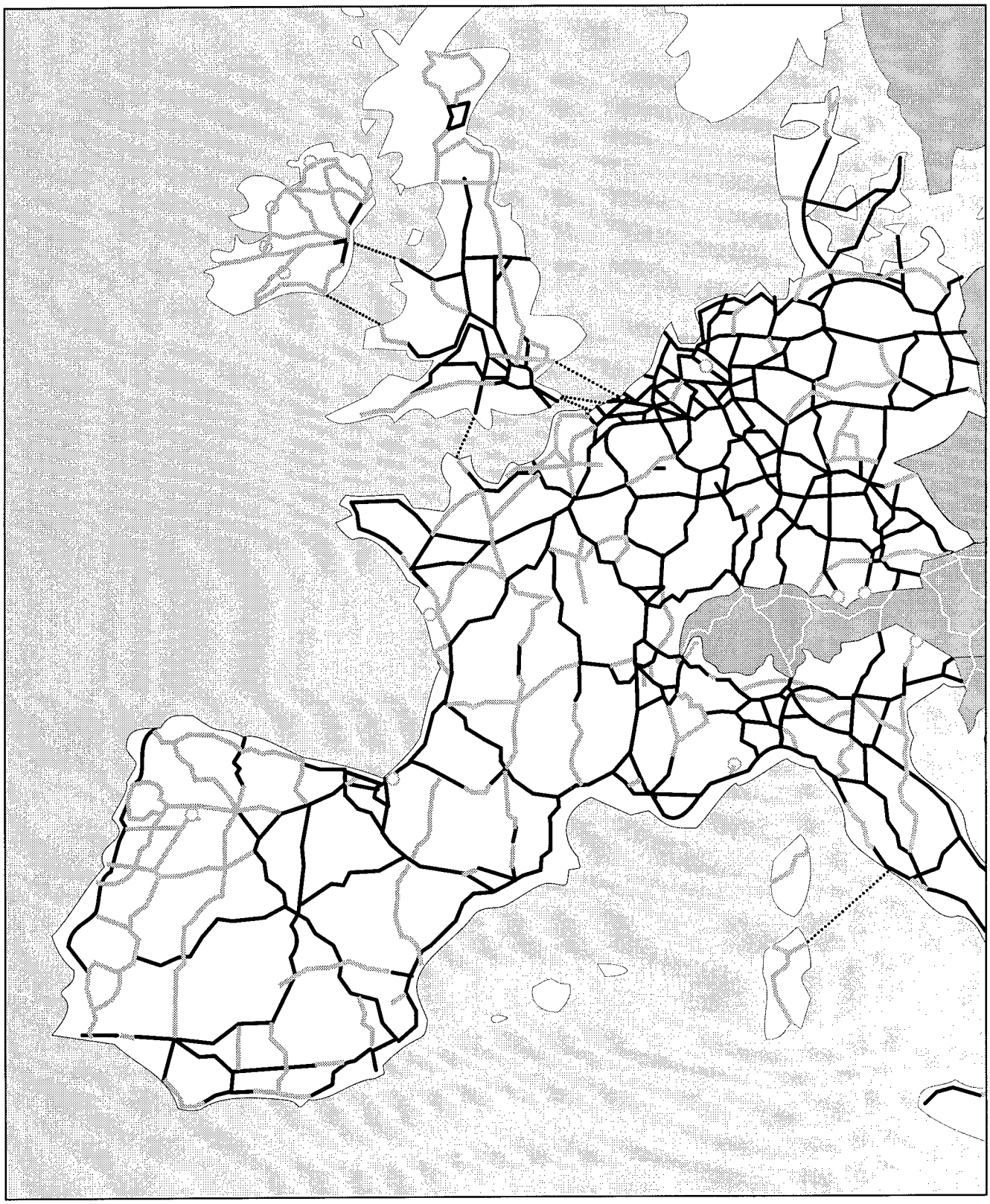
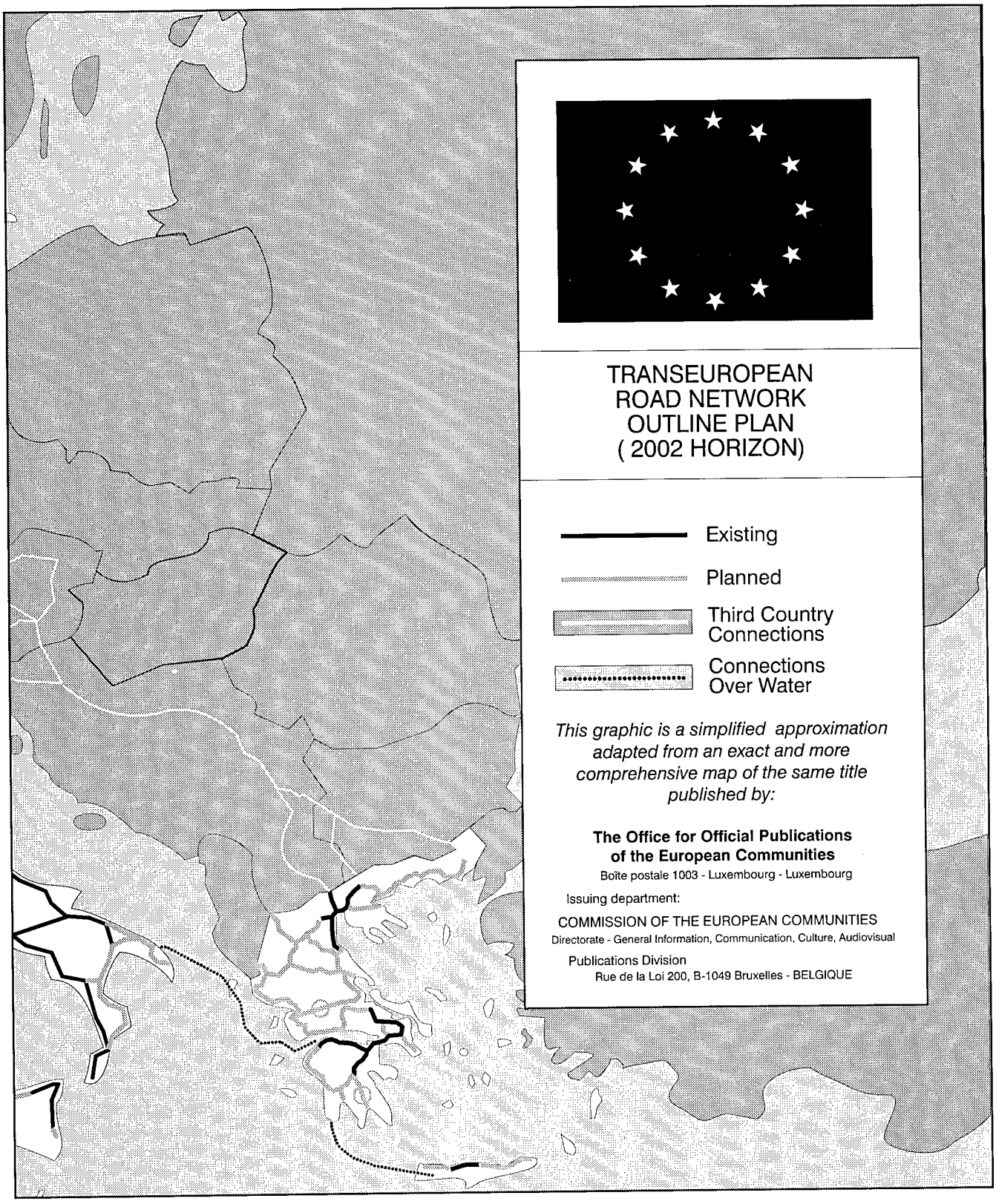


Figure 4: Trans-European Networks—Road Networks



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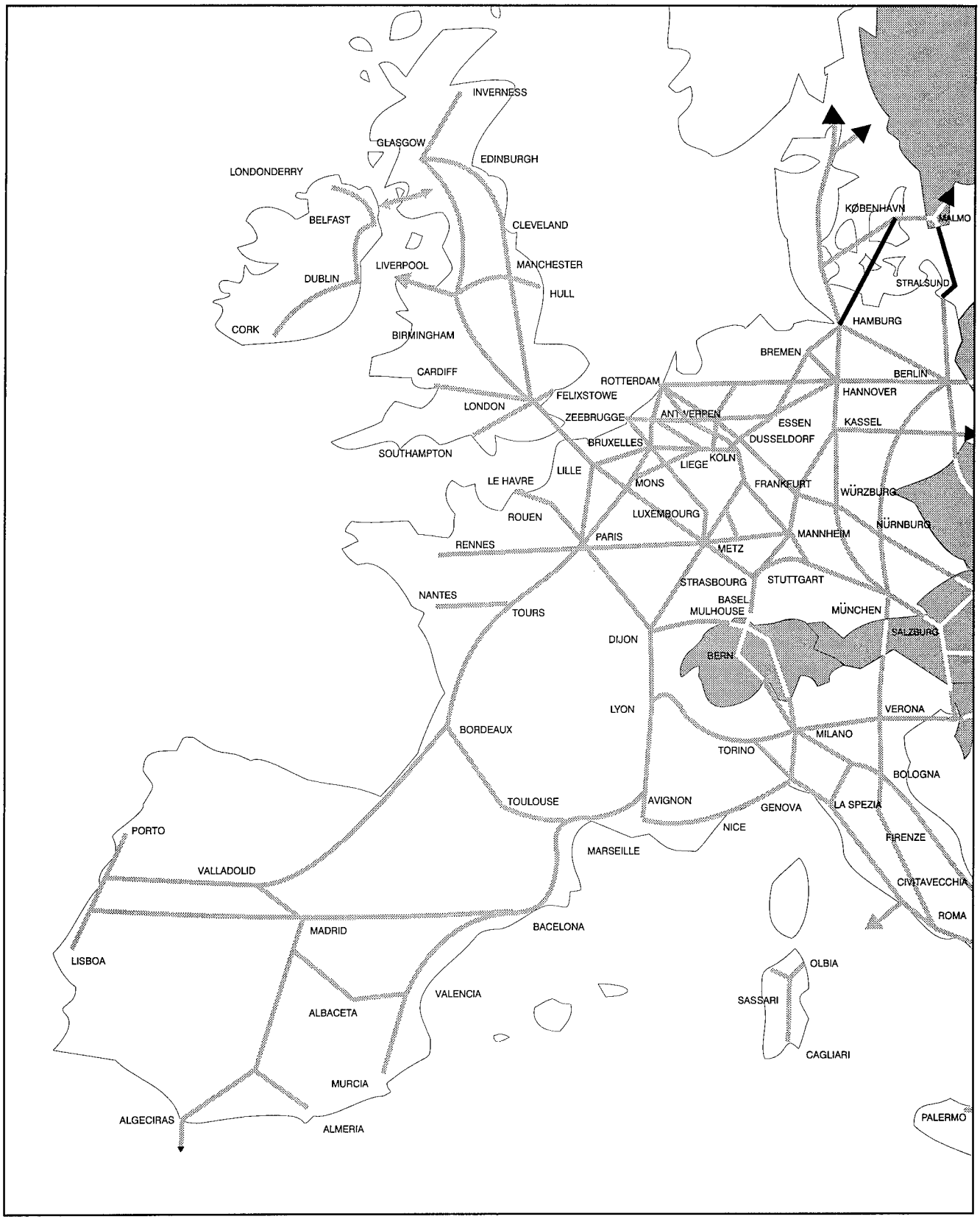
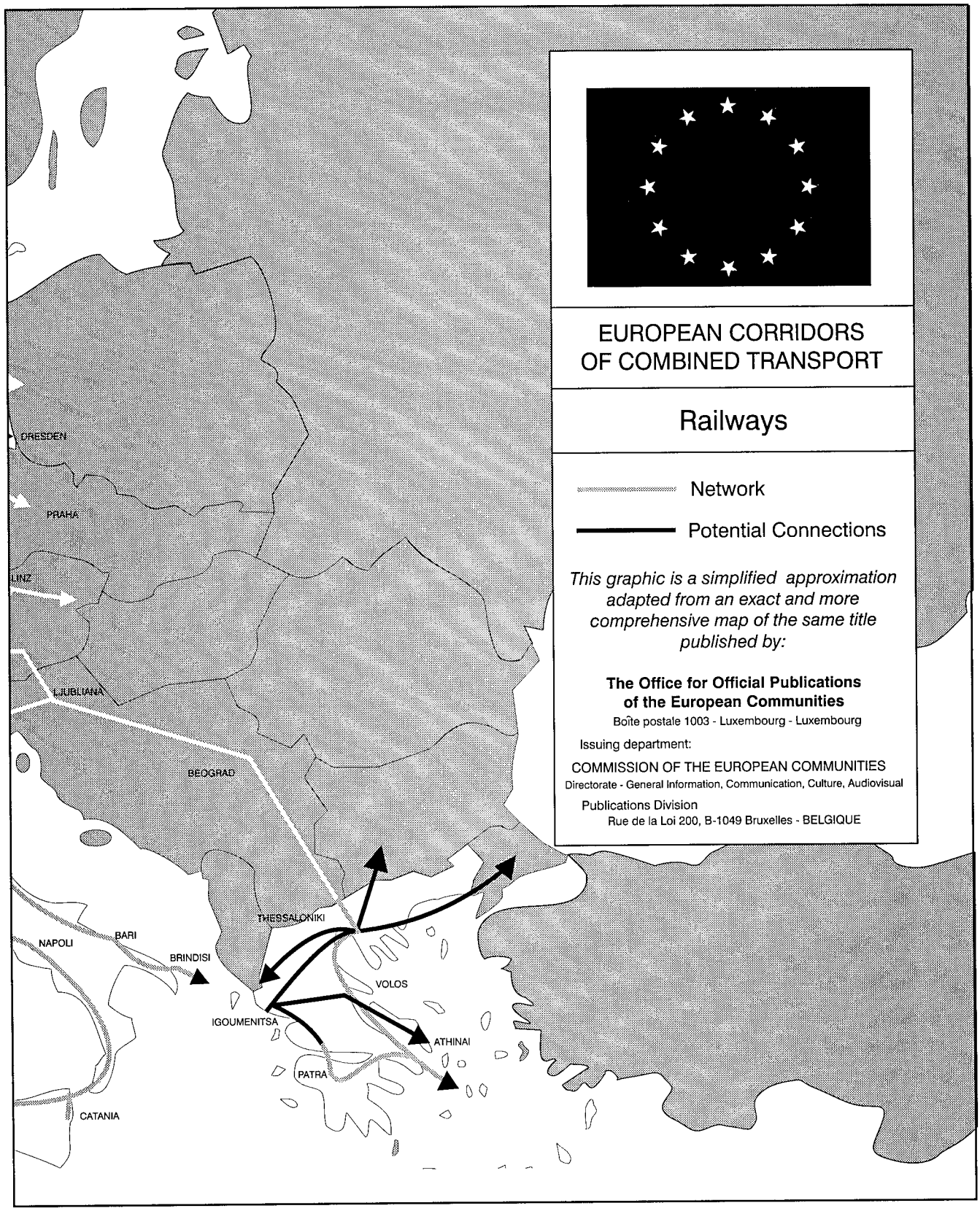


Figure 5: Trans-European Networks—Combined Networks



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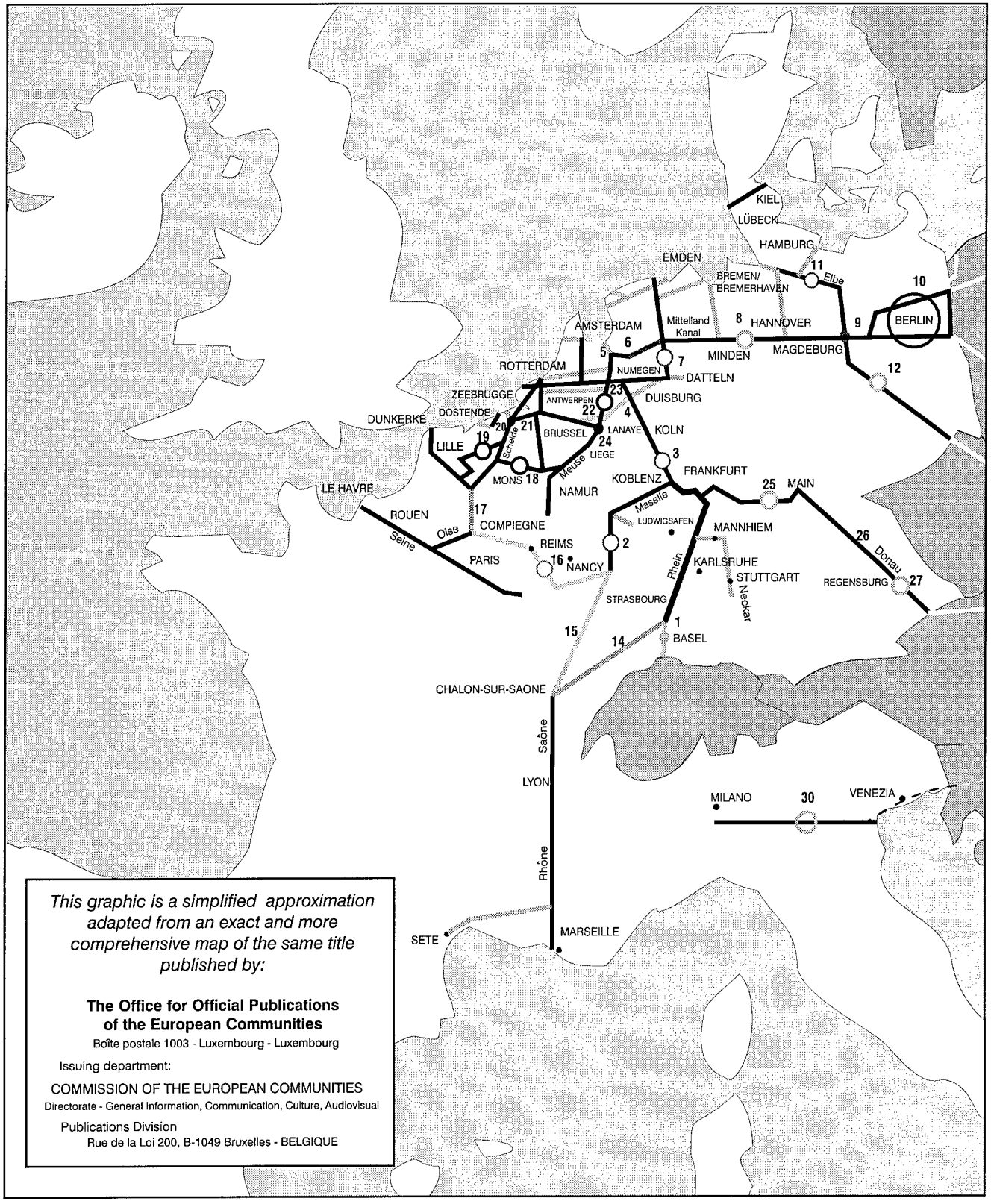
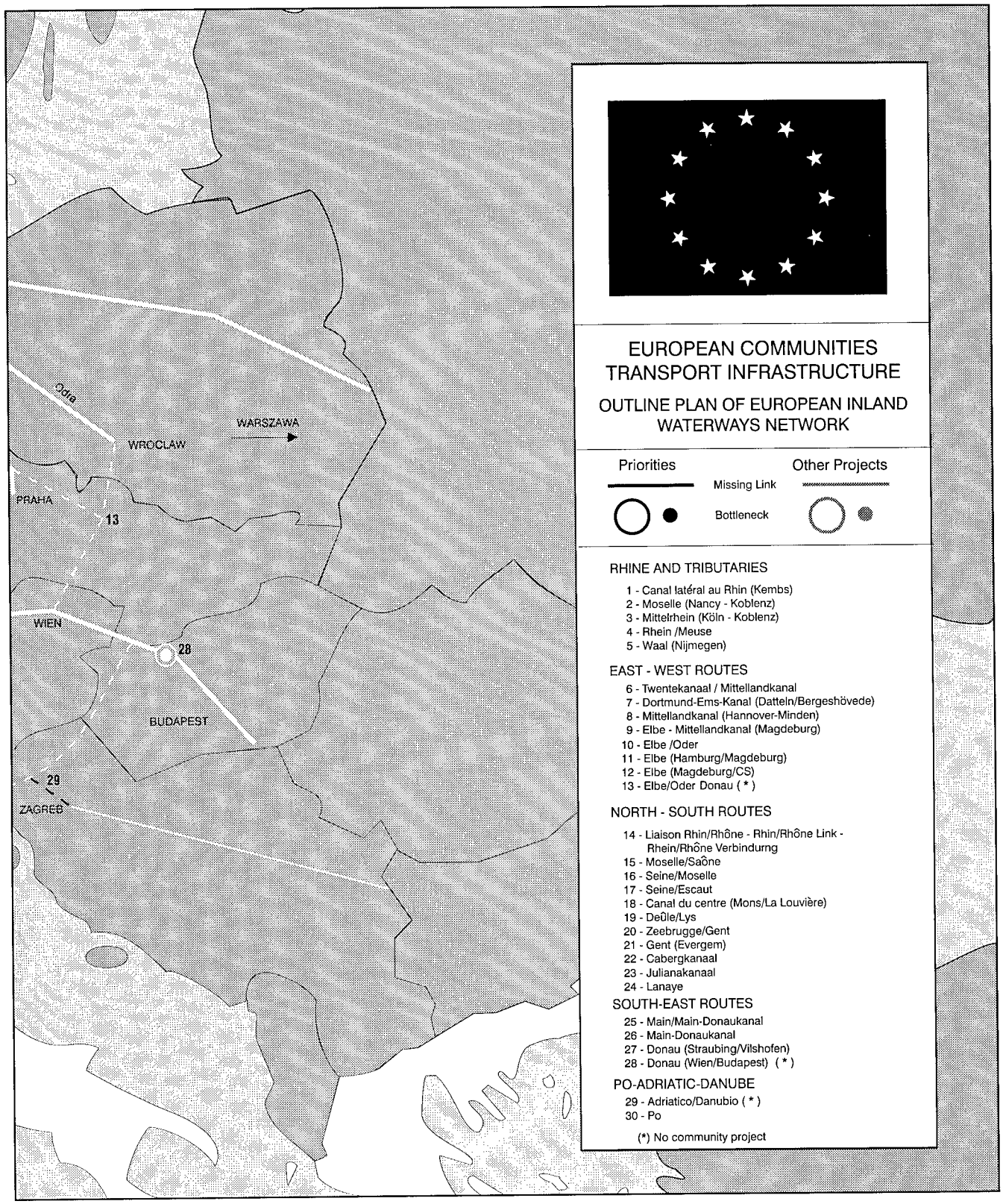


Figure 6: Trans-European Networks—Inland Waterways Network



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The EC is developing guidelines for a trans-European airport network, recognizing the need to integrate airports into an overall intermodal network and their role as nodes in the transportation system. These guidelines will include the identification of an airport network of European Community interest, including the connections with other networks (i.e., ground access to the airport). The airport network will include the following four components:

- Community connecting points, providing international links to and from the Community network.
- Regional connections, providing links within the Community network.
- Feeder points, providing service to and from the regional connecting points.
- Accessibility points, providing limited services to regional and feeder connecting points as well as to other transportation networks.

All the airports that fall within the description of these four components will be included in the trans-European airport network. Four sets of criteria will guide EC investment in projects that are part of this network. These include the following:

- Enhancement of airport capacity and efficiency, including projects to improve air traffic control facilities.
- Expansion of the airport system, including new or expanded runways, taxiways, and terminals.
- Enhancement of environmental compatibility, including projects to mitigate or reduce impacts caused by air traffic as well as impacts from airport-generated traffic.
- Development of access to the airport and connections with the other networks, including development of new links to provide better access to the airport (e.g., mass transit to the central city) as well as better strategic links to the other main networks, including seaports.

These networks were developed with input from the member countries, experts from industry, transportation operators, and users. The ultimate goal of the EC is to use these networks as the basis for development of a passenger and freight intermodal transportation system. In developing the networks, the EC role is one of promoting the connections between the various transportation networks of the member countries and not in developing infrastructure. The networks provide a flexible tool for ensuring that EC investment forms part of an overall transportation strategy. Networks allow member states freedom to act, however their actions must be consistent with the guidelines for the trans-European networks.

1.4 EC Funding

The EC has limited funding for transportation investments through an infrastructure fund, but does not intend to become a primary source of investment in place of the member states or the private sector. It is budgeted that a level of investment of around 400 billion ECU during the period from 1990 through 2010 is needed to ensure adequate functioning of these Trans-European Networks. This amount is reflected below in the bottom, right cell of Table 1.

Table 1: Funding Required to Complete Trans-European Transportation Networks [in billions of ECUs (U.S. dollars)]

Mode	Priority Projects by 1999	by 2020	Investment Necessary by 2020
Roads	81 ($ 91.53)	62 ($ 70.06)	143 ($161.59)
High-Speed Trains	72 ($ 81.36)	62 ($ 70.06)	134 ($151.42)
Combined Transport, Conventional Railways	22 ($ 24.86)	23 ($ 25.99)	45 ($ 50.85)
Inland Waterways	14 ($ 15.82)	6 ($ 6.78)	20 ($ 22.60)
Ports	1.5 ($ 1.70)	0	1.5 ($ 1.70)
Airports	24 ($ 27.12)	5 ($ 5.65)	29 ($ 32.77)
Vessel Traffic Management	9 ($ 10.17)	5 ($ 5.65)	14 ($ 15.82)
Air Traffic Management	8 ($ 9.04)	0	8 ($ 9.04)
Total	**231.5** ($261.60)	**163** ($184.19)	**394.5** ($445.79)

Budget data in ECUs, reprinted with permission, are from the EC, Directorate General for Transport (DG VII). U.S. dollar conversions are at 1.13 ECU per dollar.

There clearly is not sufficient funding from the EC to meet the infrastructure needs. The Infrastructure Budget in 1993 was at a level of 195 million ECU. While other funding sources exist (i.e., the Cohesion Fund provided for under the Maastricht Treaty and the Regional Development Fund), these are not at levels sufficient to support the infrastructure

requirements. As a result, the focus of the funding from the Infrastructure Budget is on feasibility studies, loan guarantees, and interest rate subsidies at different rates for the different means of travel. The primary purpose of the fund is leveraging national and regional funding of projects that fall within the framework of the trans-European networks. The Cohesion Fund and the Regional Development Fund provide funding at higher levels and allow the EC to achieve broader economic goals in financially weaker regions. The funding of infrastructure projects from these funds, however, is based on the trans-European networks and accompanying guidelines.

1.5 Incentives for Combined Transportation

It is generally recognized that, due to the existing cost structures and short distances for most freight movements (90 percent of the goods in the EC are transported at distances less than 200 km or 125 miles), incentives are needed to move toward a higher market share for combined transport. These incentives are needed until more permanent measures are in place to ensure that the true costs of each mode are actually incurred (internalization of external costs).

As a result, the EC established a new program in 1993 for funding pilot projects at 3 million ECUs. The program was established to encourage the implementation of combined transport projects that are within the framework of the trans-European combined transport network. These pilot projects are supposed to bring together all participants in the combined transport chain (public and private) to create a permanent improvement in the quality of service. The projects must meet certain economic evaluations (e.g., sufficient demand to be fully subsidy-free within two years). The role of the public agencies is limited to initial assistance with the development of the project and support for a limited period during its operation, much like the IVHS program in the United States. The value to the public agencies is the opportunity to generalize on the results of the projects over the whole network and to test ideas for further development. Priority is given to road/rail projects, but inland waterway projects may also be included. Many of these projects are within congested corridors or corridors where truck restrictions currently exist.

The EC has established other incentives, such as allowing higher weight limits on trucks used in combined transport (44 tons rather than 40 tons) and allowing new railway operators into the combined transport market for international routes. The EC passed legislation allowing open access for new railway operators in the combined transport market (Directive 91/440). This directive establishes a separate management and accounting system for rail infrastructure with required charges to be levied on a non-discriminatory basis. While these incentives are important, it is generally recognized within the EC that unless changes are made in road pricing, only marginal contributions in removing trucks from the highways can be made through shifts to combined transport.

Terminal efficiency has been recognized as critical to making intermodal transportation a viable option. On a typical 600-700 km trip by combined transport, it is estimated that over

40 percent of the costs are generated by road trips (drayage) and terminal operations. As a result, the EC is supporting research on the development of a "Smart Intermodal European Transfer" (SIMET) terminal. This work will lead to the development of standards for a high-technology terminal of the future. The EC is also looking at improving ports in the western and southern periphery to make short sea shipping more cost-effective, particularly as an alternative to relieving the congestion on the north-south movements across the Alps (see Figure 7: Trucks Using Rail Over the Alps: Protecting the Environment). Finally, the EC is encouraging the creation of freight distribution centers. These centers can reduce the number of trips within urban areas through more efficient logistics practices. Germany is moving in this direction through the Guterverkehrszentren (GVZ) concept.

1.6 Conclusions

The EC, through its Combined Transport policy, is committed to developing intermodal transportation systems. The establishment of the trans-European networks for all modes of transportation recognizes that a more rational use of existing and future infrastructure is necessary, particularly considering the environmental constraints on the expansion of the transportation infrastructure. Much can be gained through a continued dialogue with the EC, especially as we consider our many similarities with them in (1) transportation policy development (i.e., ISTEA and the CTP), (2) the network basis for national infrastructure programs (i.e., NHS/NTS and trans-European networks), (3) research programs supporting intermodalism (i.e., road pricing, external costs, advanced communications systems for transmission and processing of information at all links in the intermodal chain), and (4) our similar constraints in funding and environmental matters. Areas that offer particularly high potential include the following:

- Evaluating how the EC and member countries are developing strategies for intermodal transport over short distances (this would be of value in certain densely populated regions of the United States).

- Comparing the EC experience in developing the trans-European networks and the integration of these networks with our work on the NHS and NTS.

- Sharing information on areas of common research interest. This would include the advanced technology terminal work and the travel demand modelling work to support the trans-European network integration.

To facilitate this dialogue and to achieve the benefits of shared experiences in intermodal policy implementation and research, the United States Department of Transportation should strongly consider establishing a formal working agreement with the EC.

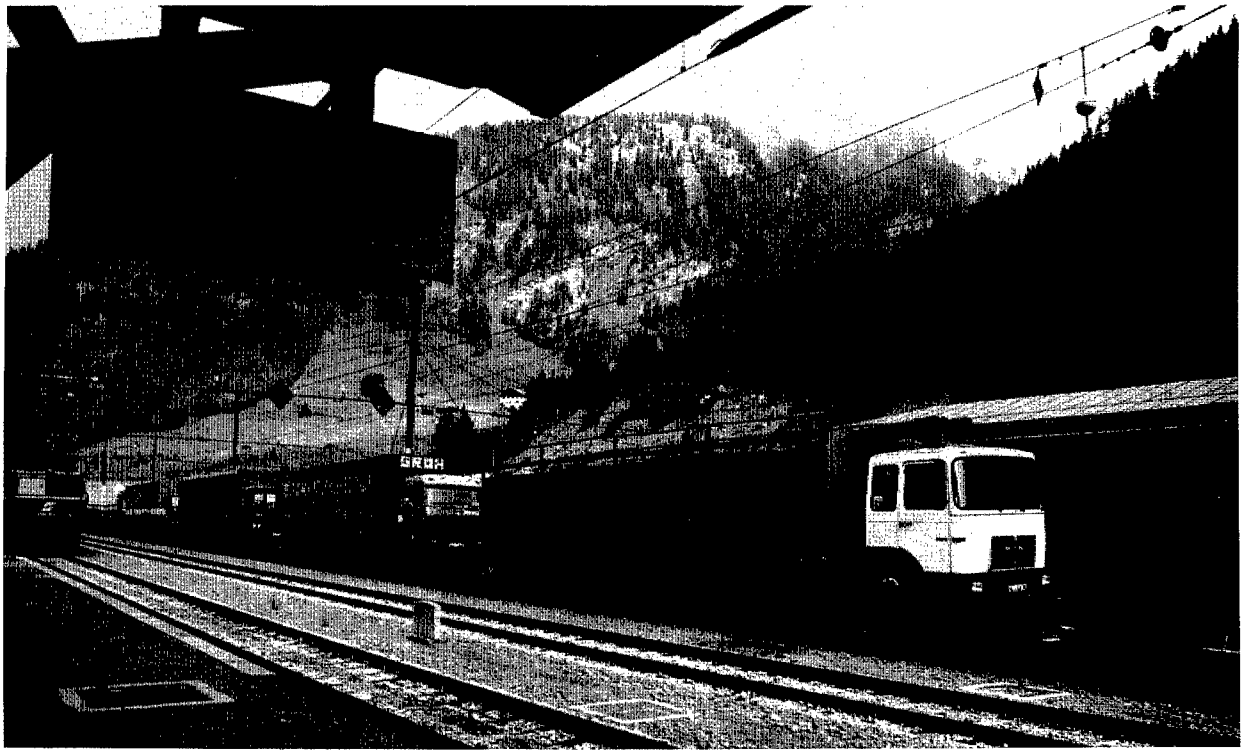

Figure 7: Trucks Using Rail Over The Alps: Protecting The Environment
Reprinted, with permission, from *Intermodal Transport, System Advantages Intelligently Linked,* Deutsche Bahn AG.

2. Summary Report on the Netherlands

2.1 Background

The Netherlands has a rich tradition of transport and distribution. It is critically located as a European and world gateway and provides key access to the massive European market; indeed, nearly one-third of all the freight in Europe is transported through the Netherlands. It is densely populated, having some 15 million inhabitants. (If the United States were as densely populated, it would have 3.3 billion inhabitants instead of 250 million.)

Over the years the Netherlands has developed road, rail, and water networks, not only to serve its own internal needs, but to enhance its distribution system with the hinterland of Europe. In its programs to maintain and upgrade these networks, the Netherlands faces three major problems: limited financial resources, environmental concerns, and a lack of physical space.

Dutch policy concentrates on using the infrastructure efficiently while maintaining the environment and the quality of life. It also has to complement the growth and development in other European countries. The situation thus requires a broadly based, integrated traffic and transportation policy designed to create "sustainable solutions," or, striking a balance between individual freedom, accessibility, and environmental amenity.

The transportation master plan, policies, and programs for the Netherlands are detailed in the Second Transport Structure Plan (the First being in 1988), which was approved by the Council of Ministers in 1990, and extends to the year 2010. It was developed by the Ministry of Transport, Public Works, and Water Management, together with the Ministry of Housing, Physical Planning, and the Environment. It emphasizes cooperation with and between other ministries, the provinces, the municipalities, commerce and industry, and social organizations. The Second Transport Structure Plan is not only a policy document, but also it identifies the network and programs for each mode, both for the Netherlands and as part of the European Union Plan.

2.2 Accessibility and Congestion

The transport industry (all inclusive) contributes 34 billion guilders[2] to the national income and employs nearly 350,000 people. Much of this is associated with the world's largest seaport in Rotterdam, Amsterdam's Schipol Airport, and, to a lesser extent, the Port of Amsterdam.

Accessibility and competitive position of these engines of the Dutch economy are, however, causing great European concern. The same is true for the quality and cost of

[2] One U.S. dollar is roughly equivalent to 1.7 guilders.

transport. These factors threaten the Netherlands' gateway position and they also influence the country's attractiveness as a location for business and industry.

Economic growth has brought a much higher than predicted increase in highway traffic (12 percent overall and more than 20 percent on the trunk highway network since 1986). The economic and social cost of congestion has risen to more than one billion guilders a year. By 2010, automobile use could increase by 70 percent and the cost of congestion could quadruple. In particular, the Randstad—the contiguous urbanized area comprising Rotterdam, The Hague, Amsterdam, Utrecht, and Dordrecht—could be gridlocked.

The movement of goods by highway is increasing even faster than that of people. Unless rapid and effective steps are taken to encourage high standards of accessibility and increased transport of freight by rail and water, and to enhance the efficiency of road transport, truck ton-miles will nearly double by 2010. Since long-range highway plans envision essentially selective expansion of road capacity, rigorous mobility management and modal shifts are seen as critical.

2.3 The Environment

In addition to the problems of accessibility and congestion, the Netherlands is equally concerned about the effect of increased transport on the environment in three ways—air pollution, noise pollution, fragmentation of the countryside, and erosion of the amenities in rural areas.

The Dutch acknowledge that measures to improve accessibility may not be compatible with environmental and quality-of-life goals. This potential conflict places some limits on the extent to which the transport system can be allowed to serve narrow economic goals; further, that economic growth which fails to accord quality of life its due importance will saddle future generations with a heavy environmental burden and, perhaps, even destroy future generations' chances of achieving the rising standards of living to which this generation itself aspires. This generation is thus challenged to find intelligent and creative solutions to transportation problems.

2.4 Developments In Europe

The Dutch vigorously support the transportation principles of the EC and take no small amount of pride in noting that the EC plans essentially follow Dutch policies and initiatives. They are concerned, however, that the path to free trade and transportation efficiency within the EC could be hindered by the somewhat protectionist attitudes of individual member states.

Among other issues which must be resolved across the EC are liberalization of the use of foreign carriers and fiscal harmonization relative to excise duties, fuel tax, vehicle taxation, and vehicle dimensions and weight. A side effect of fiscal harmonization is that it will improve the competitive position of environment-friendly modes of transport. Improvement

of rail and waterway capability will enable part of the potential growth in highway traffic to be transferred.

Rapid and massive changes are taking place throughout Europe resulting in both problems and opportunities. All these factors compel the Netherlands to continually assess its position in the EC transport policy with a view toward safeguarding Europe's advantage vis-a-vis other international economic blocs such as the United States and its NAFTA partners (Canada and Mexico), and Japan and other Asian countries such as South Korea, Hong Kong, Thailand, Singapore, and Malaysia, which are experiencing high economic growth.

2.5 Modal Projections

The following is an attempt to summarize and characterize the freight transportation modal scenarios forecast by the Dutch Ministry for 2010.

Motor Carrier

- Increase in tons carried from 460 to 725 million.
- Ton-mile increase of 70 percent.
- Some shift to rail and water.
- Efficiency programs result in a decrease in truck-miles traveled.
- Effective measures in environmental protection and safety come from the trucking industry, in concert with government.
- Joint government/truck industry programs develop other important social and economic policies.

Rail

- High-grade rail links between seaport areas and their markets.
- Dutch system fully integrated into European network.
- Increased axle loads on principal routes.
- Doubling in traffic to 50 million tons per year.
- Threefold growth in container traffic to 750,000 containers per year.
- Privatization and position of freight within Dutch Railways resolved.
- Dedicated freight routes and rail infrastructure programs completed.

Waterway

- Trunk waterways linked with each other and with other countries.
- Trunk network accommodates at least 1350-ton minimum.
- Total volume increase to 370 million tons per year.
- Rotterdam-Germany route accommodates six-barge sets, and other principal routes, four-barge sets.
- Adequate, alternative routes for recreational traffic developed.

Seaport

- Four major seaport areas linked to national and international trunk routes.
- Rotterdam served by principal highway, rail, water routes.
- Seaward access maintained at high level.
- Dredging problems adequately resolved.
- Logistics developments fully utilized.
- Area-based approach to environment/land-use issues developed.

Air

- Schipol's function as international freight hub strengthened.
- Schipol operates within constraints set by sustainable development goals.
- Schipol accessed directly by primary highway and rail links, indirectly by waterway and seaport.

2.6 Combined Transport

The Transport Plan states that a large proportion of the growth in market share of rail and waterway freight will be concentrated in international container traffic and intermodal transport. The most promising routes are: (1) from Rotterdam to Germany and thence to Italy and Eastern Europe; (2) France and Spain; and (3) important intermodal markets and routings with Austria, Switzerland, Italy, and the countries of the Danube region. Success in these markets depends on the development and expansion of combined highway/rail, water/rail, and water/highway transport.

The Dutch feel that the trucking industry will need to be more active with rail and waterways. They believe that the major highway carriers and shippers need to participate financially and organizationally in the determination of haulage combinations and advanced logistical services aimed at improving the trucking industry's efficiency and routing control of freight traffic flows. In this regard, key social and economic policies related to road haulage are being developed by the government in conjunction with the industry's representative organizations.

The railways' role will lie in the area of container transport and in regular and shuttle freight services, with planned Rail Service Centers playing an important part. Four or five such centers are to be established over the next few years, with a long-term target of ten or more. This will require substantial investment, to which the government will contribute. It will also help fund the introduction of technologies for new container handling systems.

Waterways also play an effective part in a more integrated transport system. Around 25 percent of the containers transported between the Rotterdam area and Germany go by inland waterway, and container traffic on the waterways has grown in recent years, by about 20 percent. Much can be expected of combined road/water transport, given the development of roll-on/roll-off ferry services, and there are also good prospects for combined rail/water transport.

The government will support initiatives from local authorities and the waterway industry for the development of freight-distribution centers and inland terminals, and will seek to create the right framework in such areas as infrastructure and international regulation. In this connection, steps are being taken to improve EC regulations on cross-frontier traffic, including the necessary standardization.

Government funding totalling several million guilders will be needed over the next few years for combined-transport terminals serving the waterway network. Decisions on the need for further funding will depend on market development and the industry's own initiatives. A framework is being developed to assess such initiatives.

2.7 Spending Needs

Table 2, which follows, reflects the spending needs to 2010 set forth in the Second Transport Structure Plan. It should be emphasized that this is a needs estimate, not an authorized budget, and is now three years dated; however, it is an accurate depiction of the relative amounts necessary for modes and projects supporting a multimodal approach to transportation problems.

Table 2: Transportation Spending Needs of the Netherlands to 2010

Project	Billions of Guilders
Collective Transport	
• Netherland Railways	17.5
• Metropolitan regions	6.9
• Employer-provided transport	
• Operation	74.8
• High-speed line	2.8
Trunk Highways	
• Maintenance	17.3
• Utilization	2.1
• Construction	17.7
• Tunnels	2.1
Waterways	
• Construction	4.2
• Maintenance	6.7
Rail Freight	
• Rotterdam-hinterland	1.5
• Betuwe line	2.5
• Operation	1.3
Highway Safety	
• General	3.0
• Special programs, projects	
Urban Traffic	
• Grants for urban traffic schemes	2.2
Incentives	
• Information technology, human factors behavior, combined transport, seaports etc.	
Research/Stimulation	6.4
Total	168.9

Data, reprinted with permission, from *The Second Transport Structure Plan,* and confirmed by the Royal Netherlands Embassy in June 1994.

2.8 Comprehensive Funding System

After consideration of several options to finance the construction and maintenance of its transportation needs, there is agreement between appropriate government entities that an Infrastructure Fund is the best means of providing the framework for implementing an integrated transportation policy. This enables priorities to be set in a more coherent fashion and optimizes the management and use of available resources.

The Fund, which combines the National Road Fund, the Mobility Fund, and the relevant sections of the Ministry of Transport budget, provides grants for the passenger and freight infrastructure, whether the projects are for highways, railways, waterways, air transport, or ports. Such grants will cover capital spending on new infrastructure, capacity expansion and improvements, replacement investment, maintenance, management, and project preparation, but not the purchase and operation of vehicles, vessels, or aircraft.

A large proportion of Fund expenditures relate to central government projects; grants to the railway infrastructure also will be a major item. Other grants go to local government and private companies, and there is provision for a limited but significant loan capability enabling peaks in capital spending on particular cases to be covered by borrowing on the capital market.

Fund income comprises general tax revenues, a proportion of motor-vehicle tax revenue, a proportion of the yield from petrol duty, contributions from outside bodies, and the income from tolls and the peak-hour surcharge on motor-vehicle tax.

2.9 Transport Regions

In the Netherlands the equivalent of our Metropolitan Planning Organization (MPO) is known as a Transport Region. While it does not yet have the formalized authority and planning responsibilities of an MPO, the functions and structure of the Transport Regions have been detailed in the national plan and are deemed critical to administration of the plan.

A Transport Region plan recognizes that a collective and integrated approach is needed—horizontally, between communities, and vertically, between communities, provinces, and central government—at both urban and rural levels. It recognizes that the country's administrative structure is currently directed more toward environmental physical planning than to action on transportation problems, and it is essentially for this reason that the necessary cooperation needs to be institutionalized. No one model is favored, but it must include local authorities working with industry, carriers, and other interested parties to adopt a regional transportation policy consistent with the structure plan.

Tasks of a Transport Region are to prepare and implement a broad spectrum of transport planning and programs—local and regional public transport, the road network, safety, cycling, and freight transport. They must also account for the related areas of land

use, environmental protection, housing, and economic development. Provincial (state) authorities and the central government, in addition to their own input, will coordinate the Transport Region's plans.

In addition to this government interaction, the Dutch plan also clearly states the need for the knowledge, skills, and experience of the various transportation carriers and organizations in the comprehensive planning process. It also notes that these forces are still too often fragmented, but that the state should be concerned with infrastructure provision and helping set frameworks. This process of establishing appropriate forums is very much a part of central government activity.

2.10 Conclusions and Observations

Direct comparisons between the transportation situations in the United States and the Netherlands are not easy, if for no other reason than the obvious differences in size, demographics, and the respective histories of transportation development. Nonetheless, there are important similarities at both political and operational levels, and we have much to learn from each other.

Transportation problems in the Netherlands are serious, are increasing, and in general are similar to ours in that highway congestion and adverse environmental impacts are at the core of the situation and have little or no prospect of improving without smarter use of freight transport systems, primarily through full modal usage, while allowing the freight sector to help the economy grow most efficiently.

In the Netherlands, strong direction, comprehensive planning, and truly intermodal funding are provided at the central government level, and the program is complementary to the greater European Community program. While the same degree of federal leadership from both legislative and executive sources may not be desirable in the United States political structure, it appears that the Dutch system of federal leadership has produced priority-based funding mechanisms and policies that promote and allow the fulfillment of intended intermodal transportation systems as part of total societal goals.

3. Summary Report on Germany

3.1 Background

With a combined population of 83 million since unification in 1990, Germany has recognized that the development of its transportation infrastructure, especially in the context of intermodalism, is one of its primary objectives for both economic growth and ensured compatibility with environmental and social enhancement. To achieve this, government regulations, programs, and projects at both the national and regional levels, in concert with overall EC objectives and the political and economic opening of Eastern Europe, are beginning to place heavy emphasis on increasing the share of environmentally friendly modes of rail and waterway transport in the growth of both passenger and freight transport operations.

3.2 Federal Traffic Infrastructure Plan of 1992

To do this the national government has planned annual investments of roughly 25 billion[3] deutsche marks in response to its Federal Traffic Infrastructure Plan of 1992 (FTIP '92). By year 2010, expected expenditures for these projects will total more than 493 billion deutsche marks (see Table 3 for more details). A large share of these funds is targeted to the states that joined the German Federal Republic in 1990.

Driving forces behind the need to improve Germany's transportation infrastructure are focused on the following factors:

- Formal organization of a single European market.
- The need for improved mobility within a larger geographic area of a united Germany, which is located in the center of Europe.
- Growing demand for transport services which, until recently, was concentrated mostly on road transportation.

As a preliminary step in developing a more integrated transportation policy, the federal government issued in 1990 a "Transport Policy of the Nineties." That policy identified the need for coordinated strategies that supported cooperative investments for transportation improvement, environmental protection and traffic safety, development and implementation of modern transportation technology (especially intermodal), and a coordinated market strategy that focused on rational use of modal transportation systems.

[3] Approximately 1.7 deutsche marks equal one U.S. dollar.

Table 3: German Federal Traffic Infrastructure Plan 1992: Total Investments 1991 - 2010

	Billion DMs	Percent of Total	New Construction and Development	Percent of Total Investment
German Federal (DB) and German Reichsbahn (DRB) Railway	194.9	39.5	108.3	22.0
Federal Highway System	191.4	38.8	99.6	20.2
Federal Waterways	28.0	5.7	14.7	3.0
Subtotal	414.3	84.0	222.6	45.2
Air Transport	None due to privatization			
Financial Aid Under The Community Transport Financing Law	76.1	15.4		
Miscellaneous	2.6	0.6		
Total Investment	493.0	100.0		

Data, reprinted with permission, are from *Federal Traffic Infrastructure Plan 1992*, 15 July 1992, Federal Minister of Transport, Federal Republic of Germany.

Coordination efforts between federal, regional, and local governments were focused on integrating traffic forecasts for short- and long-distance passenger and freight transportation. This required establishing criteria for assessing the profitability and urgency of projects which are the responsibility of the federal government. This project included the major national highways, improving the efficiency of the combined operations of the German Federal Railway (DB) and the German Reichsbahn (DRB) of the former East Germany, and improving federal waterways.

Under the FTIP '92, improvement of air transport was left primarily to the private sector, given national policies to privatize that sector of the transportation industry. For the other modes, however, government assistance included expanded use of intermodal facilities at inland ports and freight-distribution centers, new modal transportation technologies, and more use of advanced communications systems, including electronic data interchange.

Investment policies, in part, are focused on the following goals:

- Basic reconstruction and improvement of the transportation infrastructure in the former East German states, including East Berlin.
- Establishment of a high-speed network of the railways in Germany and other European countries.
- Elimination of road- and rail-congestion points along important transportation corridors by optimal use of intermodal systems.
- Increasing the safe capacity of domestic air transportation, including those air traffic systems that affect international commerce.
- Establishment of modern transportation control and information systems.

Policies established recognized the priority of the economic efficiency of these systems, conservation of the environment and energy, and regional and local planning issues and concerns. Furthermore, these policies needed to comply with the emergence of trans-European transportation networks, particularly major transportation corridors (see Figure 8: Foreign Lorries on German Roads).

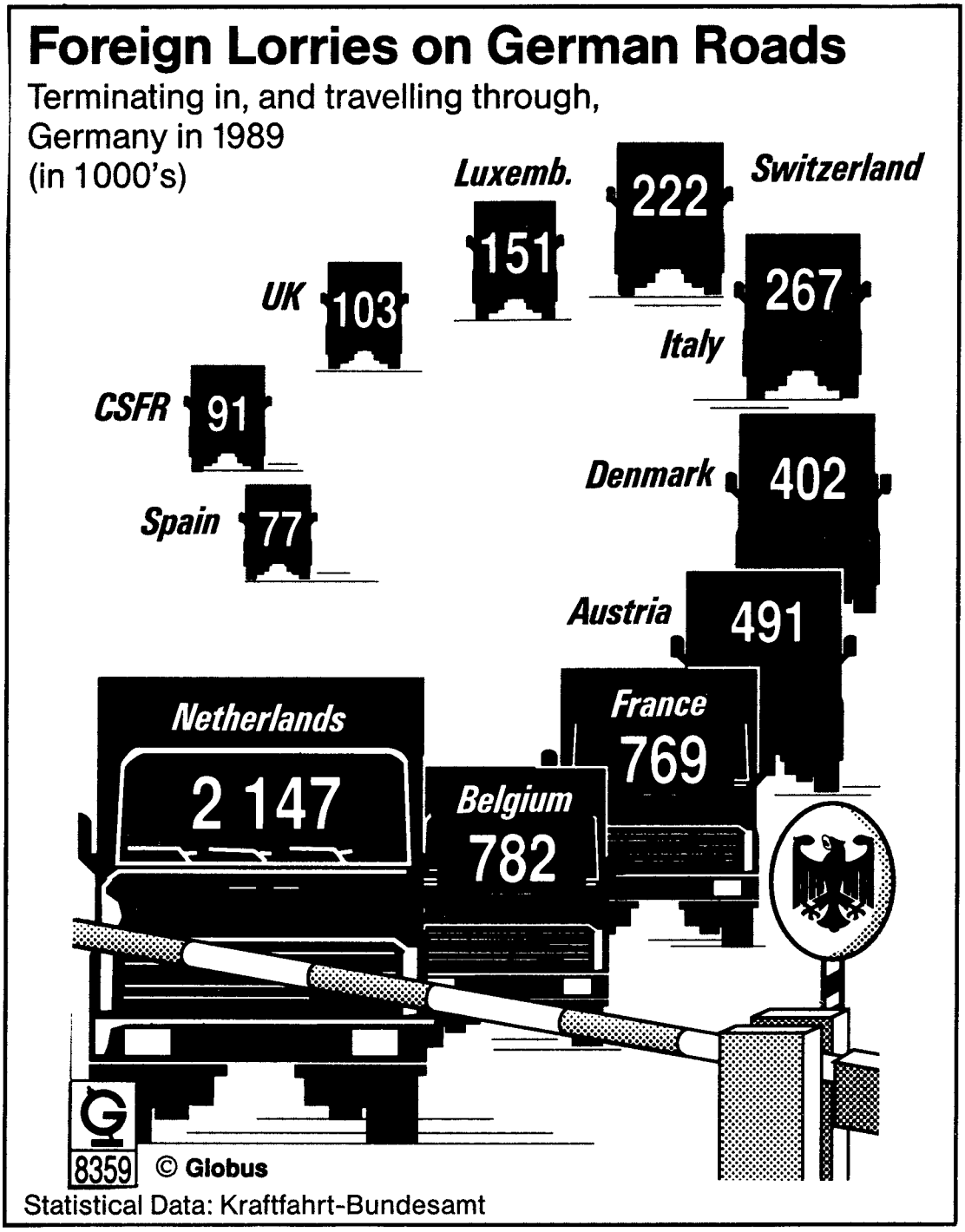

Figure 8: Foreign Lorries on German Roads

Reprinted, with permission, from *Intermodal Transport, System Advantages Intelligently Linked,* Deutsche Bahn AG.

About 80 percent of the investment program of the FTIP '92 is targeted for so-called "definitely planned projects." For example, included are major infrastructure improvements to the following:

- Existing rail lines, including those that connect with important rail operations in neighboring countries, and the development of 2,200 kilometer (1,400 mile) high-speed lines to allow speeds up 200 kilometers (125 miles) per hour—a network for higher speeds of 200 to 300 km/hr (125 to 185 mph) with a total length of approximately 3,200 km (2,000 miles) will not be established until 2010.

- Upgrading and maintenance of the federal highway infrastructure.

- Improvement of federal waterways, especially deepening of existing waterways, upgrading of existing locks, and advanced navigation systems.

With combined transport, federal policy is focused on shifting road traffic to the rail (see Figure 9: Germany's Plans for Intermodal Stations). This includes within the next few years dividing the national rail system into three distinct units, including operating, passenger, and freight, as a preliminary step in privatizing the system in the near future.

3.3 Freight Distribution Centers/Marine Transportation

With a key focus on the country's rail system, the federal government has recognized the need for and support of more than forty Guterverkehrszentren (GVZs) or freight distribution systems that connect two or more modes for improved intermodal transportation of domestic and international freight. The development of intermodal transfer facilities will involve the federal railroad, which will spend approximately four billion deutsche marks ($2.4 billion). These facilities will also accommodate short-distance transportation of freight within major urban areas. With longer-distance traffic, freight transportation will concentrate on the use of unit trains that will connect with these urban centers, using advanced information systems. (See expanded discussion of one GVZ in the Technologies section appearing next in this report.)

Ports, including deep sea and inland, are recognized as having considerable growth potential in freight traffic for both domestic and international commerce. This includes major investment measures for the national waterway network for more efficient and safer inland navigation. Particular emphasis will be placed on those inland waterway networks that support intermodal transport, especially as the majority of Germany's large cities have direct water connections to these inland waterways. Incentives to make these improvements will be given where highway connections can be developed, particularly at border-crossings within a radius of 150 km (94 miles) of inland ports.

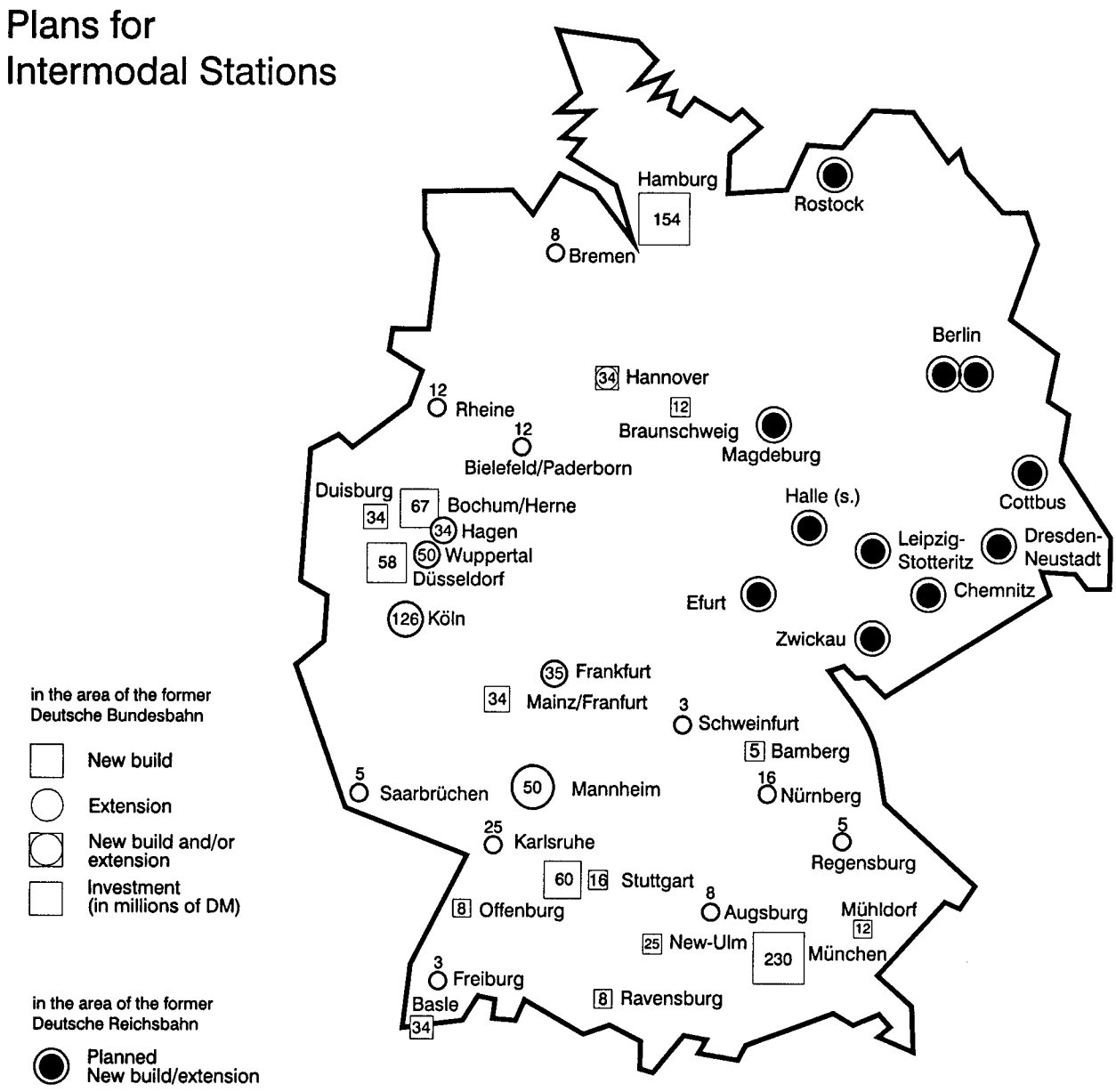

Figure 9: Germany's Plans For Intermodal Stations

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Communication system improvements include taking advantage of the technology developed by the PROMETHEUS project of the European automobile industry, which is supported in part by the German federal government. PROMETHEUS is a European intelligent vehicle highway system (IVHS) program, funded primarily by the private sector and focussed on motor vehicles. In cooperation with the transportation industry and regional governments, the federal government will take a major role in equipping major federal transportation routes with the necessary communications infrastructure.

3.4 Short Sea Shipping

One sector of Germany's transportation system that is receiving increasing attention is its short sea shipping industry, or what might be called in the United States coastal shipping. With the cooperation of vessel owners from other member nations of the EC, there are about 380 vessels available for this kind of service, some of which have a capacity of up to 2,000 TEUs.[4] Most are owner/captain operated and, at this time, are primarily involved with charter operations in north Europe and the Mediterranean. Formerly a forgotten partner in the transportation industry—as might also be said for the EC as a whole—short sea shipping is regaining renewed interest. Much of this is due to its relatively low-cost operations, which are seen as an alternative to the more costly truck/highway industry. To do this, the short sea shipping industry established only a few years ago a forum which supports the concept that vessels, formerly involved only with bulk-type of cargoes, such as ores and forest products, can be easily refitted to also carry intermodal containers more efficiently. By doing so these vessels become more cost effective, especially when transporting two-way cargoes; that is, bulk in one direction and containers in the other (see Figure 10: Examples of Coastal Shipping).

To make this all happen, the short sea shipping industry organized to gain the attention of the intermodal industry, particularly cargo owners and deepsea intermodal carriers. As a first step, key transportation managers and decision makers from both short sea shipping and cargo were identified and persuaded to join the effort. Once on board, key strategic issues that would offer short sea shipping's viable alternatives to the more conventional transportation systems already in place were identified. Included were removing restrictive regulations between coastal nations that affected short sea shipping, introducing more modern technology on board vessels, educating other key decision-makers on the benefits of short sea shipping (including the environment), and establishing uniform operating standards.

Admittedly, progress toward increased use of short sea shipping for intermodalism is slow, but moving in the right direction. Other obstacles include continuing to integrate short sea shipping regulations into those of the overall transportation regulatory framework, at both the national and EC level. Operational standards are still being developed that require closer cooperation with marine terminal operators. And, by taking advantage of improvements

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[4] TEU (Twenty Foot Equivalent Unit) is a rule of measurement based on a standard 20-foot long container.

brought about by newer vessel designs that permit oceangoing vessels to use more shallow river systems, potential new inland markets can be developed.

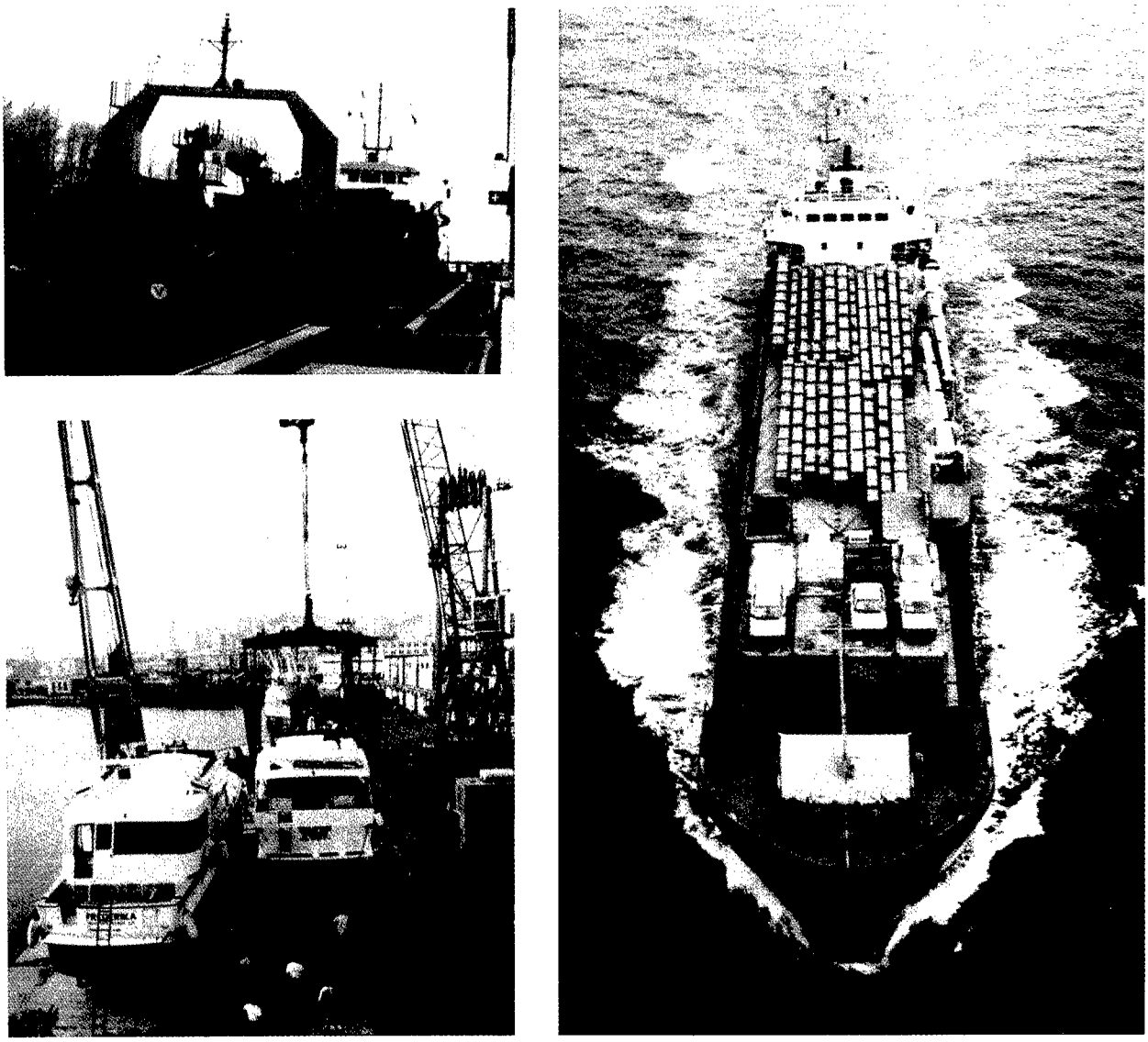


Figure 10: Examples Of Coastal Shipping

Reprinted, with permission, from *Coastal Shipping—Better for The Environment*, Interessengemeinschaft der Kustenshiffsreeder and the Verband Deütscher Kustenshiffseigner.

3.5 Industry Apprenticeship Programs

It is generally recognized that one of Germany's main reasons for meeting the economically competitive challenges of the past and the future is the long-established apprenticeship program that trains its future decision-makers and technical specialists. One such program is coordinated by the Academy for International Trade and Transportation in Bremen.

This two- or three-year program includes formalized training that combines formal education with on-the-job experience, ranging from transportation operations to third-party services and freight forwarding. With the close cooperation of Bremen's local international trade and transportation industry, students are encouraged to apply classroom theory to real-time operations when employed by participating companies. This includes several weeks in a foreign-country-based operation to gain other perspectives about the profession.

3.6 Other Observations

Discussions with both public and private transportation officials clearly indicated that Germany, as one of the leading economic centers of Europe, recognizes that complacency with transportation policies and investments is dangerous for the country's future. As a result, changes are taking place in that country that affect transportation policies, concepts, and technology at both national and local levels, notwithstanding the mandates that are being developed through the EC.

Specific forces driving this sense of urgency include modernization of the transportation infrastructure of former eastern states of that now-united country, the gradual shift from a formerly heavy industry-based economy to one that represents more subassembly production, and the opening of larger trade with Eastern Europe in context with the forces already taking place as a result of the EC. Furthermore, the overwhelming recognition of the environment controls much of the decision-making process, when it comes to developing more modern intermodal transportation systems.

To meet these challenges, it became quite apparent that one of the fundamental principles guiding the policy-making process was the need to improve cooperation between the various groups representing economic development and environmental interests. This was especially evident with the increased role of environmentalists in the planning and implementation process of upgrading and developing the country's transportation infrastructure. Despite often strong opposing viewpoints on specific policies and projects, consensus was reached early on in the development stage. Admittedly, much of the environmentalists' participation in that process was due to the growing strength of the Green Party in local and national politics; but the point was clear that consensus can be reached if all involved are willing to reach a common goal of improving the country's transportation system.

It was also evident that both government and industry were willing to make major investments in intermodal transportation to reduce the barriers of public/private relationships. A clear example of this is the eventual privatization of the national rail system to improve service. For Germany, this is a difficult problem given that country's strong underlying political support for public transportation.

Although not perhaps at the same scale as rail, the national government, in cooperation with local governments and the private sector, is urging greater use of short sea shipping and inland waterways to relieve highway congestion. Although use of this mode is still relatively small when compared to highways, the growing recognition that short sea and inland transportation is greatly underutilized is making slow but noticeable progress. This is especially true in more port and waterway improvements along major transportation corridors, most of which connect some of Germany's larger economic centers of activity.

Another example of Germany's clear understanding of the importance of transportation improvement is demonstrated by the close cooperation and sharing of risk in developing new and emerging technologies for both mobility and communication. All modes receive financial and other forms of support necessary to develop leading technologies necessary to maintain a competitive edge, especially in view of fast-changing trade patterns. In particular, ISETEC (see Technologies section which follows), technologically oriented intermodal rail transfer facilities, and the development of GVZs represent primary examples of sharing the risk between the public and private sector.

4. Technologies

The scanning team visited or was informed of several important examples of advanced intermodal technologies and operational concepts that could offer American government and private sector transportation operators additional insights to improve similar operations here in the United States. Although it was not the intent of the scanning trip to focus most of its attention on these technological concepts, the team felt that a brief mention of these operations complemented the scanning review goals.

4.1 Rotterdam's Delta Terminal

The Port of Rotterdam's ECT (European Container Terminals) Delta terminal, in collaboration with Sea-Land Services, developed what could be considered one of the world's most technologically advanced marine intermodal terminals. Constructed on filled land near the entrance to the Port of Rotterdam, this terminal is operated, to a large extent, by advanced computer applications and controls.

More than fifty automated guided vehicles (AGVs), which carry containers without drivers, shuttle containers from dockside gantry cranes to a container yard equipped with 24 automatic stacking cranes, rail-mounted cranes that store and retrieve containers until they are ready to be loaded on trucks, railcars, or other vessels. For optimum handling efficiency, deployment of the AGV fleet is centrally coordinated and synchronized with the motions of the cranes. Equipped with navigation systems, the vehicles are able to position themselves with an accuracy of plus or minus 3 cm (see Figure 11: Delta Terminal's Automated Stacking Cranes and Vehicles).

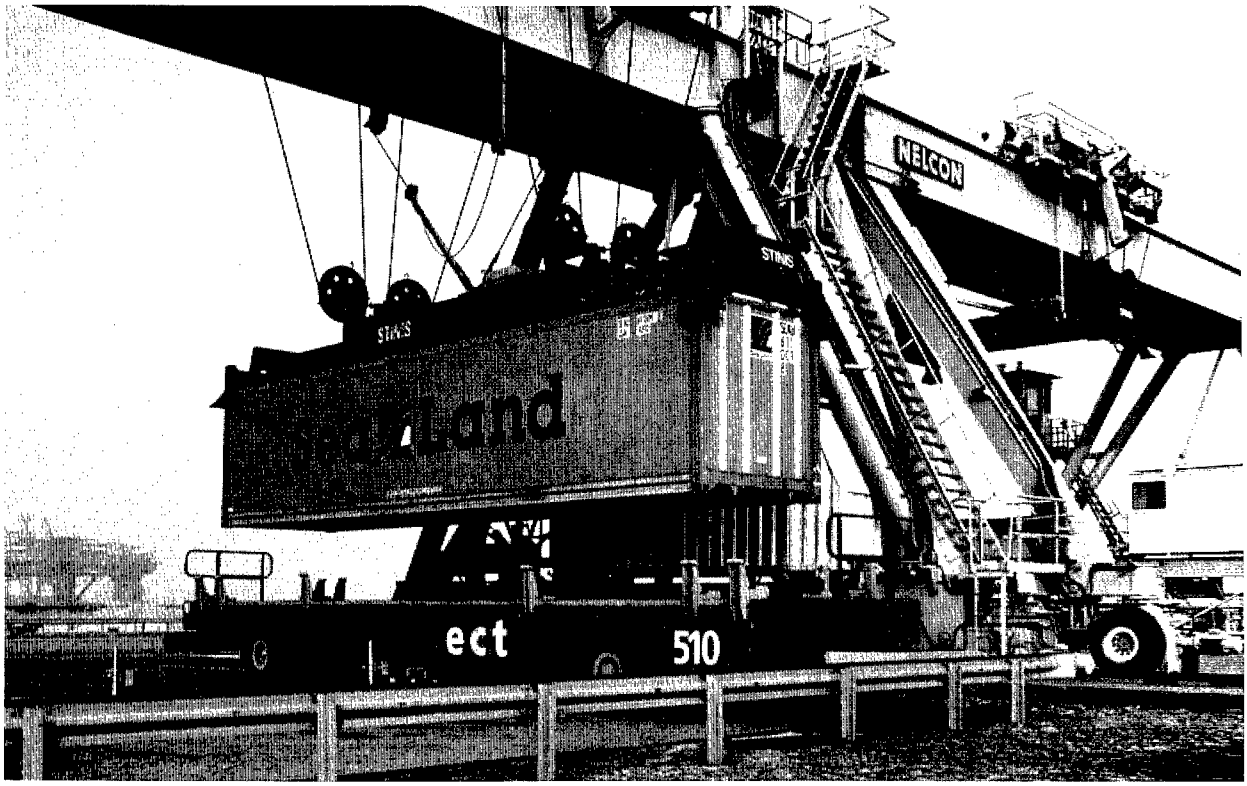


Figure 11: Delta Terminal's Automated Stacking Cranes And Vehicles
Reprinted, with permission, from *Sea-Land Service, Inc.*

The new terminal, which has an initial capacity of 550,000 lifts a year, serves anywhere from 60 to 80 containerships on a weekly basis. Eight container cranes, including four "dual hoist" machines, along with the automated vehicles, allow for a nearly continuous flow of containers (see Figure 12: Various Views of Delta Terminal's Automated Operations). Equally remarkable at this unique terminal are its intense labor-saving operations. By one estimate, the facility needs only 10 percent of the usual labor force that would be employed on a traditional marine intermodal terminal. These savings were achieved via joint involvement of labor and management early in the facility's design. Persuasive points raised during these early discussions included the desire by all parties to maintain Rotterdam's premier position as a container port and the corresponding jobs and training necessary to operate and maintain the highly automated equipment.

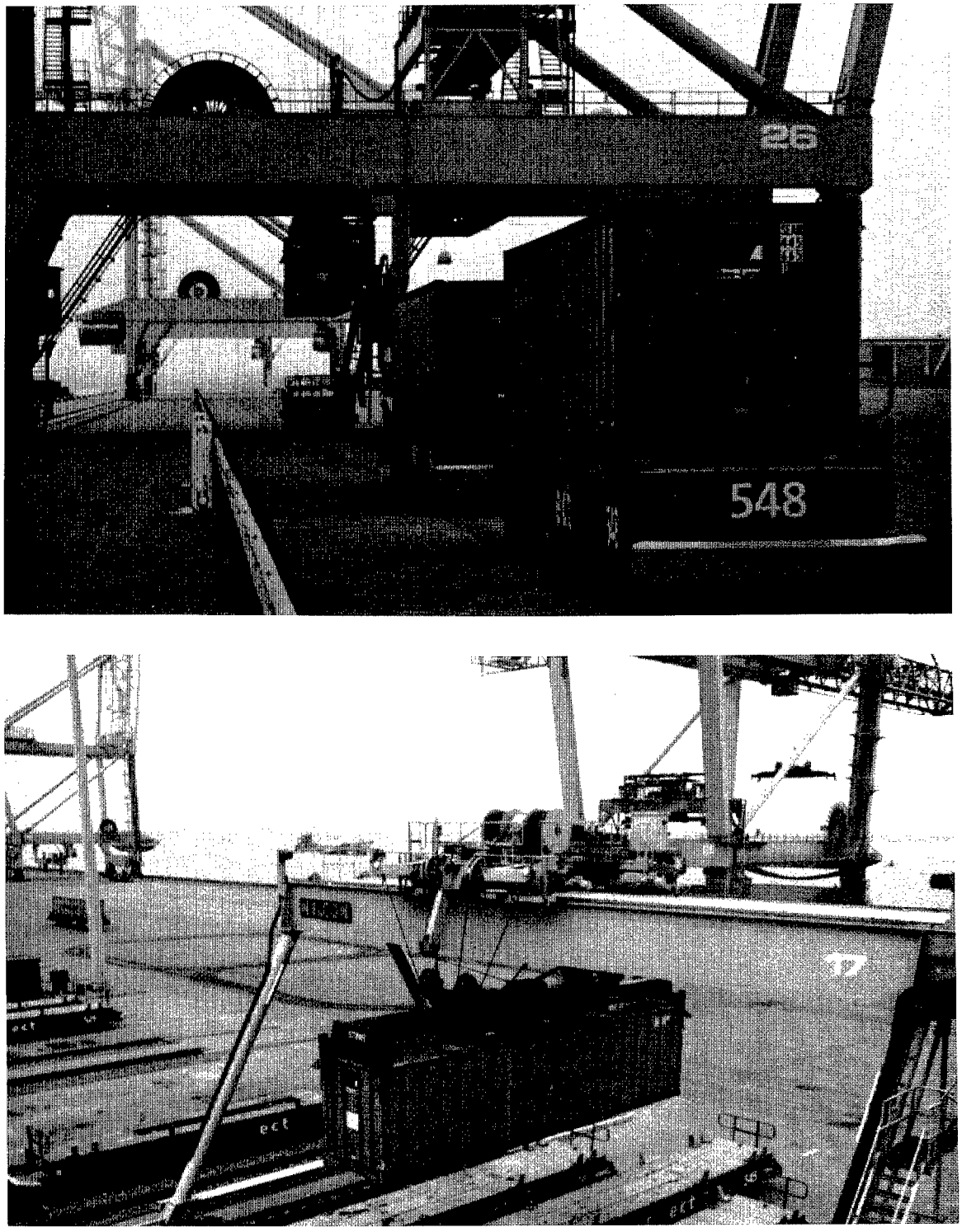
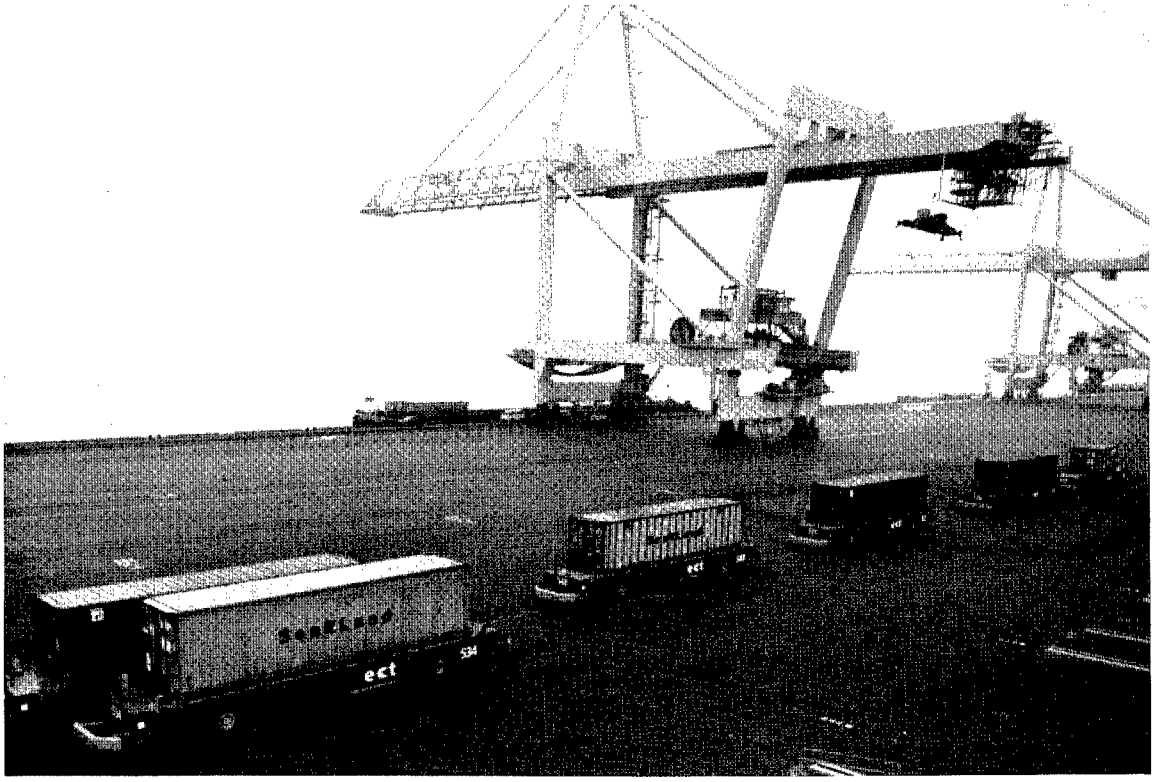
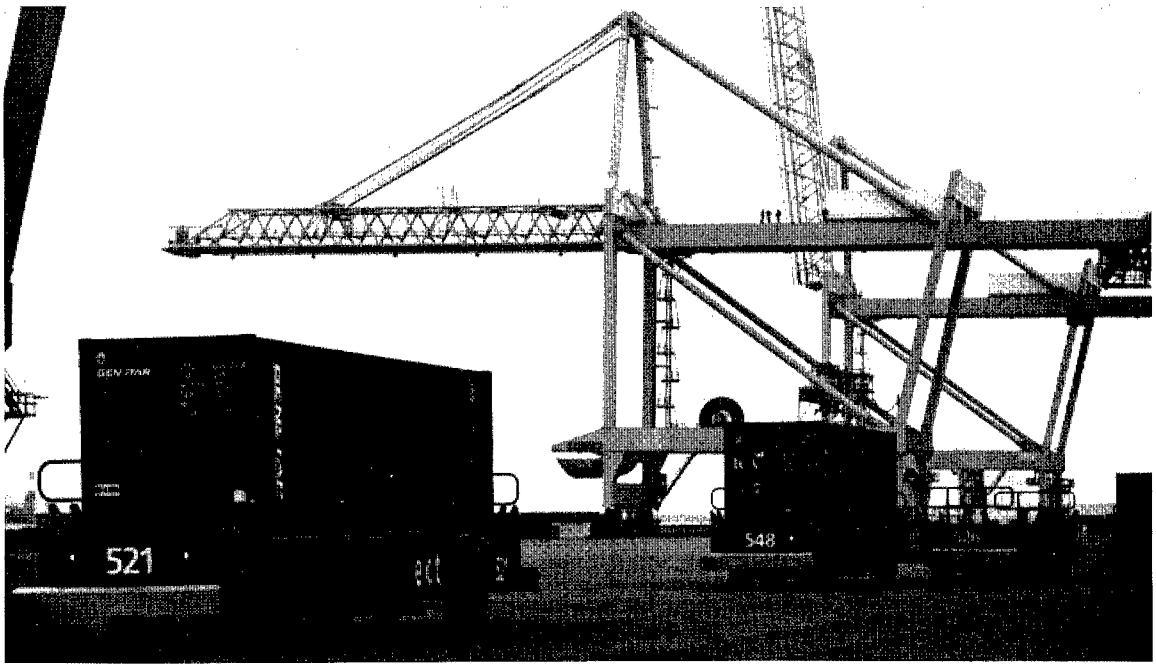


Figure 12: Various Views Of Delta Terminal's Automated Operations



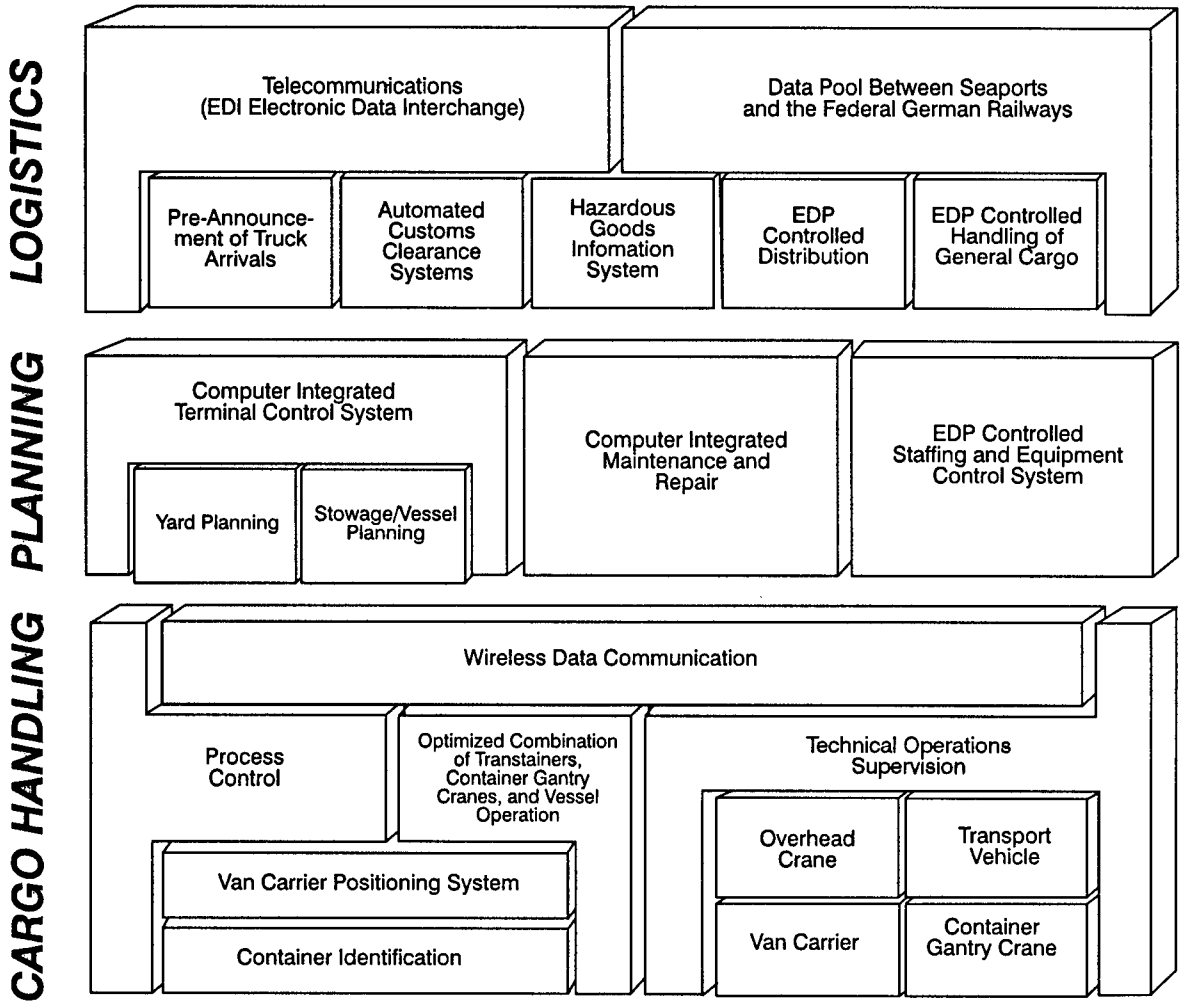


Photographs by Mannesmann Demag Gottwald, Dusseldorf

4.2 ISETEC (German Port Industry Terminal of The Future)

Several German seaports pooled research and development funds and human resources in order to develop advanced marine terminal intermodal container-handling technologies and concepts to increase the efficiency and profitability of German seaports. The partners, which include BLG Bremen Warehouse Company, Bremen; DAKOSY Datenkommunikations-system GmbH, Hamburg; dbh Datenbank Bremische Hafen GmbH, Bremen; Eurokai, Hamburg; HHLA Hamburger Hafen-und Lagerhaus, Hamburg; along with close cooperation of the Federal Ministry of Research and Technology, developed the concept of the Container Terminal 2010. The concepts and technologies for that terminal involve advanced port-communications systems, terminal-planning systems, and cargo-handling systems. The goal is to coordinate shipping lines, agencies, forwarders, trucking companies, railways, and customs into one centrally-controlled system that speeds the flow of containers in, through, and out of the marine terminal, and improves maintenance and repair. This information is automatically collected and interpreted aboard straddle carriers, forklifts, and gantries, and then sent by radio to a central electronic data processing (EDP) system (see Figure 13: ISETEC's Plan for Container Terminal by the Year 2010).

For the German marine container industry to remain competitive, ISETEC serves as a role model whereby collective R&D efforts result in reducing the cost of implementing new and emerging systems and technologies.



CONTAINER TERMINAL 2010

EDP CONTROLLED CONTAINER HANDLING

Figure 13: ISETEC's Plan For Container Terminal by the Year 2010
Reprinted, with permission, from *Plan for Container Terminal 2010*, ISETEC.

4.3 Bremen Guterverkehrszentren (GVZs)

In Bremen, Germany, the scanning team visited one of the leading intermodal freight transfer or distribution centers in Europe, in terms of size and number of companies involved. In many respects, the Bremen facility is a prototype for the more than forty other GVZs planned for Germany within the next few years. They serve as transfer points where short- and long-distance surface/freight traffic meet. Once fully operational, GVZs should transfer major distribution activities from the inner core of congested major urban areas to more water, rail, and highway-accessible areas just outside those urban areas (see Figures 14 and 15).

In essence, these GVZs are industrial areas where various freight transport enterprises are located, all of which remain independent, retaining their legal and economic autonomy. Services include consolidation, value-added and distribution services, vehicle and container repair, fueling stations for both cars and trucks, vehicle rental (car, truck, and container), government offices, banks, a motel, and an up-to-date truck and car wash that can handle four trucks at one time (80 percent of the water from this activity is recycled).

Entrepreneurial spirit, characterized by the GVZ concept, encourages voluntary cooperation among different carriers and facility service providers. For example, the Bremen GVZ as a whole was able to reduce its truck trips to the inner area of Bremen by almost 15 percent by rationalizing between all members the delivery and pickup of freight. Furthermore, this form of transportation rationalization has been extended to reduce the number of empty containers that normally would move to and from the GVZ.

Plans for this particular facility started more than twenty years ago, with the first tenant in place in 1984. To date, the project to date has cost more than DM 500 million ($294 million). Half of the investment was made by the State of Bremen for infrastructure and environmental preservation measures, the other half by private sector participants. Located a few kilometers from Bremen's marine cargo terminals, the 1.2 million square meter facility has more than 200,000 square meters of covered storage space. An additional 2 million square meters of farmland is designated for future development. Forty companies with almost 2,000 jobs, including 200 trainees, were in operation in 1993, representing about twenty different types of transportation and distribution activities. It is expected that an additional 4,500 jobs will eventually be located there with an additional 500 trainees. More than 3,000 highway trucks and 1,500 private cars use the facility every day.

The German National Railroad (DB) has a major intermodal container transfer station on the site, operated by a private company on behalf of the railroad. This includes four tracks (each 700 meters long, or one train length) and two portal cranes for an annual capacity of more than 230,000 units. By 1994, the German postal service will establish a major freight station there, taking advantage of the site's unique intermodal distribution service capabilities.

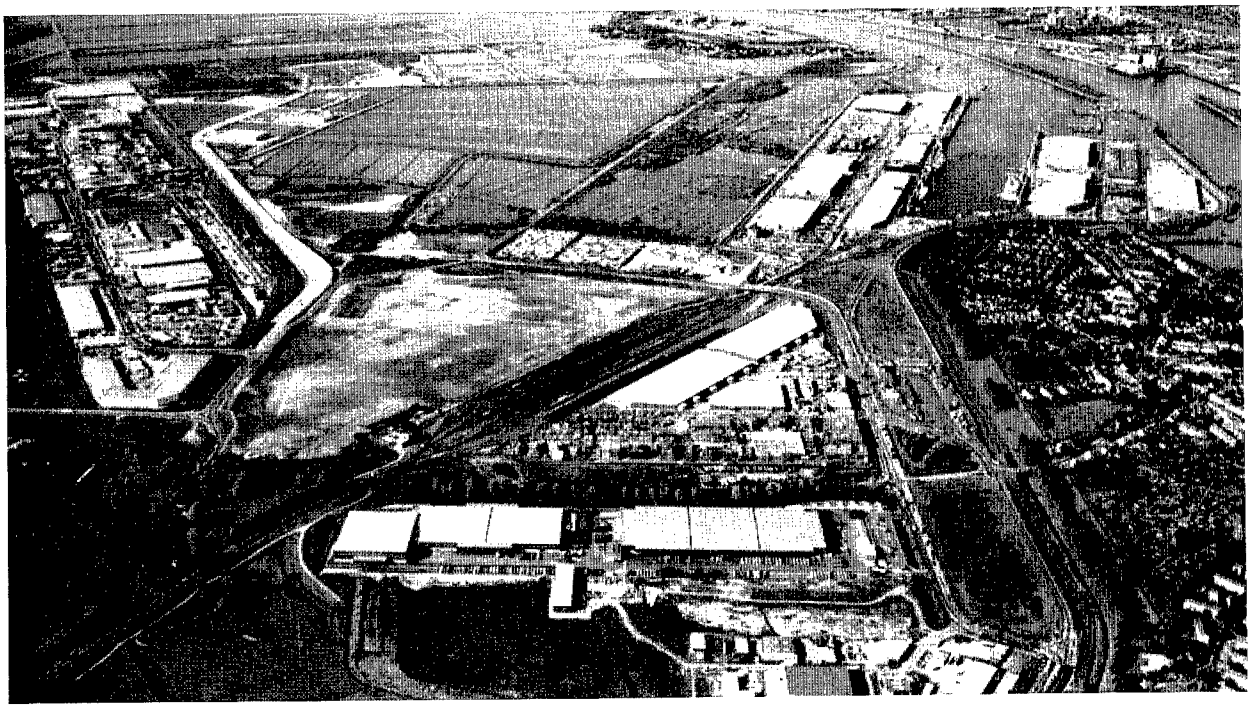


Figure 14: Aerial View of Bremen's GVZ (upper left) and its Proximity to the Port
Reprinted, with permission, from the Ports of Bremen/Bremerhaven, Germany.

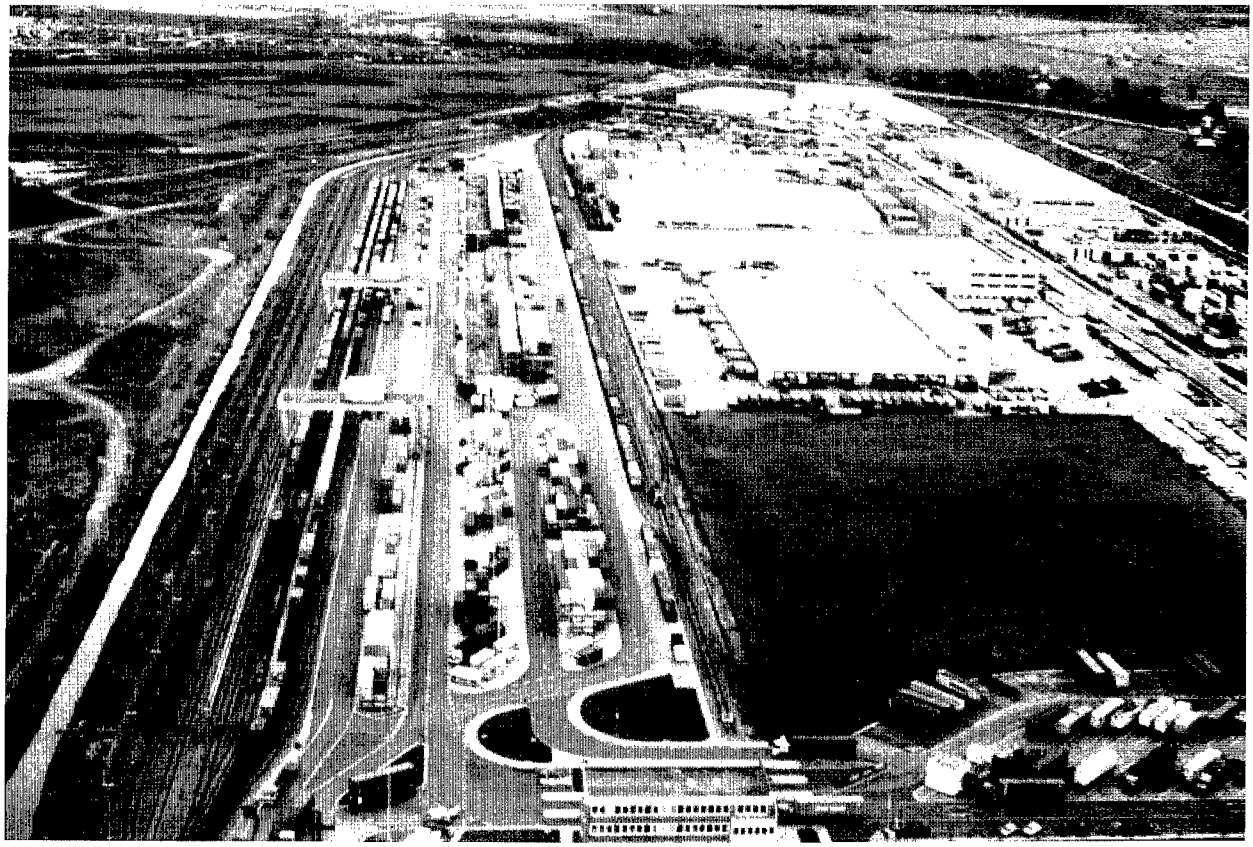


Figure 15: View of Bremen's GVZ Intermodal Yard
Reprinted, with permission, from the Ports of Bremen/Bremerhaven, Germany.

Organizationally, the Bremen GVZ is a private, limited company under German law. All companies located at the facility must be corporate members of the GVZ, with each member having one vote at company meetings. The exception to this rule is the German Railroad and the State of Bremen, with a total of six votes. Cooperative activities among its members include joint purchase of raw materials and supplies and the exchange of equipment and labor, when the circumstances require such actions. All business activities are tied together by a single electronic data interchange (EDI) system to increase the efficient flow of information and other forms of communication.

Members of the GVZ's supervisory board include three representatives of the administrative departments of the State of Bremen, four representatives of the companies located at the facility, one representative from German Rail, and one independent expert. The board makes decisions on new establishments, services, public relations, infrastructure projects, and cooperation with new GVZ projects in other major transportation centers nationally and internationally. The Bremen GVZ cooperates with other planned GVZs throughout Germany and Europe to develop uniform operating standards for this sector of the intermodal industry. Examples include Montpellier, France; Barcelona, Spain; and Berlin, Dresden, Rostock, Magdeburg, Frankfurt, and Nuremburg, Germany.

4.4 Cologne Container Transfer Facility

The scanning team also visited one of Germany's most modern rail intermodal transfer facilities, located adjacent to a major highway a few miles outside of Cologne. This facility is the culmination of similar facilities started in 1969 in response to the increased rail use of containers by shippers. Planning started in the mid-1980's and today uses some of the most modern and technologically efficient intermodal handling equipment recently developed in Germany. It serves today as a prototype for the more than 40 similar facilities planned for Germany by the year 2010. Opened in 1991, the facility is presently being expanded, completion of which is expected by 1997. By then more than 125 million DMs will have been invested in that facility by the German government (see Figure 16: Sketch of Cologne's Intermodal Yard).

There are three container-handling overhead cranes in operation, two of which use rotating headers for increased efficiency of loading and unloading. Both units use specially designed hoisting systems that prevent swinging of the containers. Each crane can handle more than 30 units per hour, with a lift capacity of 41 tons. Conventional extra heavy lift mobile units are used throughout the facility to accommodate operations when the main container cranes are in operation. All access ramps and roads are now or are in the process of being paved with concrete to ensure safe transportation around the facility (see Figure 17: Different Views of Cologne's Intermodal Yard).

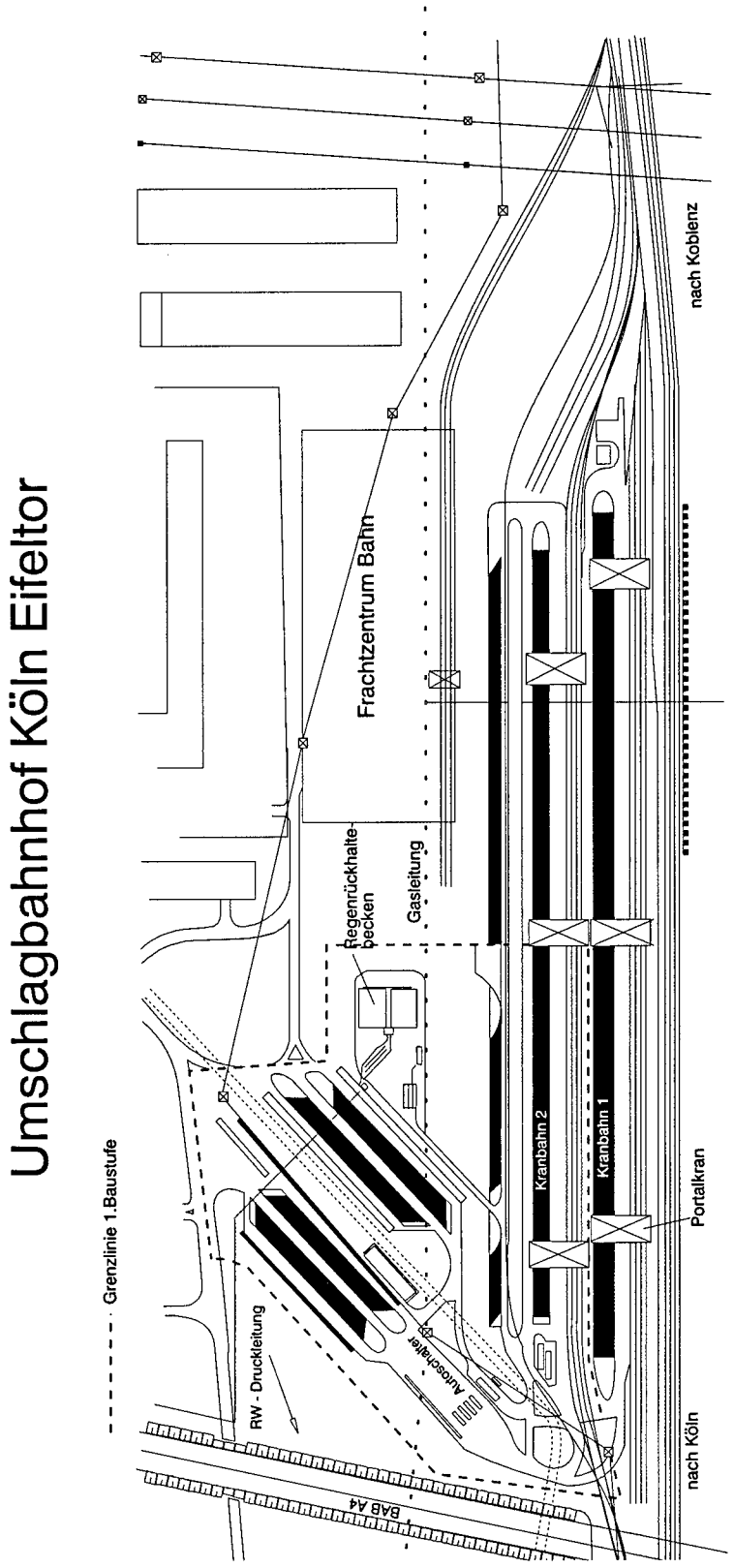


Figure 16: Sketch of Cologne's Intermodal Yard
Reprinted, with permission, Deutsche Bahn AG.

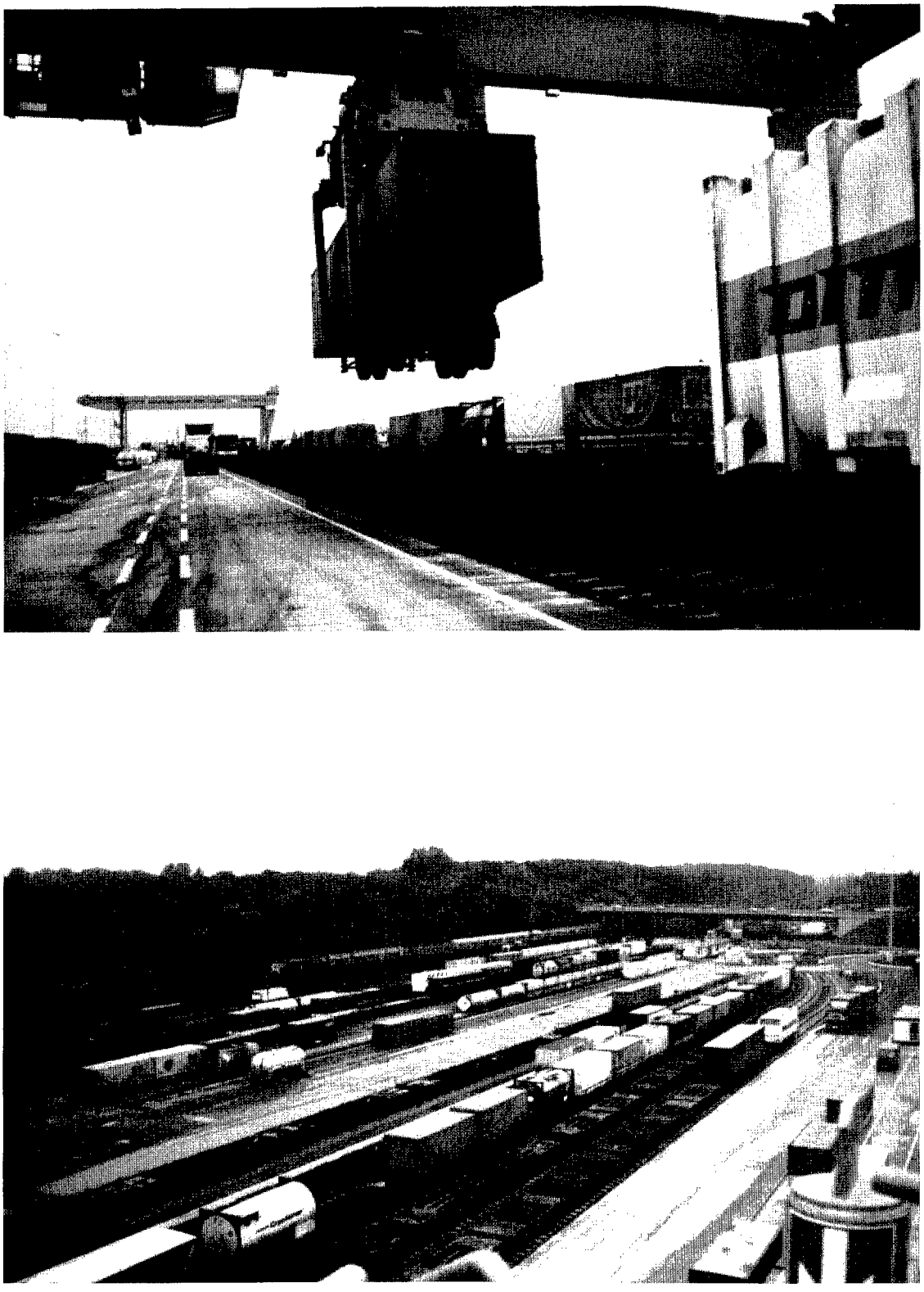


Figure 17: Different Views Of Cologne's Intermodal Yard
Photographs by Gerhardt Muller

The facility presently handles about 1,800 units daily, including 200 intermodal container storage places. Given growth trends, and with account taken for days of operation per year, annual capacity is expected to reach 450,000 units. Intermodal transfer operations take place between 6 a.m. and 10 p.m., a period of time which was established to best accommodate the growing use of just-in-time distribution practices.

There was only one limitation to this well conceived intermodal facility that the team noticed. Despite its location adjacent to a major highway or autobahn, direct access between the two is currently not possible. Trucks must follow local streets for several miles before gaining access to the autobahn. The German government has recognized this problem and has included new direct-access ramps to the autobahn from the intermodal facility in their improvement program.

4.5 SIMET (Smart InterModal European Transfer)

Because of the diversification of intermodal equipment and technology standards within the EC and the rest of the world, the EC, working through the Directorate-General for Transport (DG VII-A-4), has established a program that proposes common specifications for intermodal operations that are the most cost efficient. This includes management systems that take advantage of new and emerging information technologies like EDI and global communications.

To that end, a consortium of public and private companies have agreed to pool their technical and human resources. Outcome of the program will include a better definition of transport requirements, based mostly on the results of existing studies, inventory of the most promising technical solutions that facilitate intermodal transport, design and assessment of the most efficient methods of rapid loading and unloading, and, finally, developing specifications for integrating the new concepts and standards and modifications in existing EC operations such as Rotterdam's ECT and Germany's GVZ.

Appendix I
Persons Met With During Intermodal Scanning Trip to Belgium, the Netherlands, and Germany by Date and Location

September 13, 1993 - Brussels, Belgium

COMMISSION OF THE EUROPEAN COMMUNITIES
DIRECTORATE GENERAL—TRANSPORT

Jonathan Scheele
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International and Interinstitutional Relations

Raymond Dodge
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International and Interinstitutional Relations

Egidio Leonardi
Chief, Division of Research

J.A. Laranjeira-Anselmo
Assistant Chief, Division of Research

Giorgio Gulienetti
Division of Research

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Division of Research

Cathal O'Cionnaith
Administrator, Short Sea Shipping

Rodolfos Papaioannou
Director

Wolfgang Elsner
Head of Data and Statistics

UNITED PARCEL SERVICE

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Europe and North Africa

Johan van Berlo
Feeder Planning Manager
Europe Region

THE EC COMMITTEE OF THE AMERICAN CHAMBER OF COMMERCE IN BELGIUM

Ann Vandenhende
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September 14, 1993 - Brussels, Belgium

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Ports Planning

John Hugh Rees
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Railways, Waterways, Combined Transport

Monique Tousseyn
Administrator
Airport Policy and Development

Rolf Dieter and Adrian Veale
Analysts
Transport Networks and Infrastructure

Dominique Pavard
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Coordination of Policy, Legislation and Information

EUROPEAN INTERMODAL ASSOCIATION
Bernard Teillet
Secretary General

EUROPEAN COMMUNITY SEA PORTS ORGANIZATION
Pamela LeGarrec
Secretary General

September 15, 1993 - Rotterdam, The Netherlands

EUROPEAN COMBINED TERMINALS (ECT)

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Container Division Director

Wouter den Dulk
Chairman, Executive Board

J.C. Rijsenbrig
Director
Delta Container Division

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Directorate Commercial Development

Pieter Struijs
Management Board
Executive Directorate Shipping and Safety

SEA-LAND SERVICE, INC.

John J. van de Merwe
Vice President & General Manger
Europe

Roger E. Roels
Vice President Operations
Atlantic Division

Nick De Raadt
Inter Program N.V.
Consultant to Sea-Land Service

CITY OF ROTTERDAM

Dr. R.M. Smit
Vice Mayor and Commissioner for The Port

Harry J.A. van de Braak
Director, Foreign Affairs

September 16, 1993 - Zoetermeer, The Netherlands

DUTCH TRANSPORT (TRUCK) OPERATORS ASSOCIATION

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Frank J.D. Wiegerink
Deputy Director and Strategy Officer

R.E.G. Ravenhorst
Manager of Intermodal Planning & Policy

DUTCH ORGANIZATION FOR NATIONAL AND
INTERNATIONAL ROAD TRANSPORT (NIWO)

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NEA TRANSPORT RESEARCH AND TRAINING

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Bas Rouvroye
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September 16, 1993 - Amsterdam, The Netherlands

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Wim Ruijgh
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DUTCH NATIONAL RAILWAY COMPANY

Ed. P.J. Smulders
Director

September 17, 1993 - The Hague, The Netherlands

MINISTRY OF TRANSPORT, PUBLIC WORKS AND WATER MANAGEMENT OF THE NETHERLANDS

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W.A. van Zijst
Manager Intermodal Transport

Wim J. Stam
Director, Harbor Logistics and Infrastructure

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Senior Advisor International Affairs

J.R.M. Sitskoorn
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J.W. Oosterwijk
Director of Public Transport

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Harbours, Logistics, Telematics

A.T. KEARNEY & COMPANY

Pieter Klapwijk
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HOLLAND INTERNATIONAL DISTRIBUTION COUNCIL

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Executive Vice President

U.S. DEPARTMENT OF COMMERCE

Rafael Fermoselle, Ph.D.
Counselor for Commercial Affairs
U.S. and Foreign Commercial Service

September 20, 1993 - Hamburg, Germany

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Port of Hamburg Association for Terminal Operators

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Assoc. of Hamburg Port Enterprises, and
President and Executive Chairman, HHLA

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Director
Central Division Marketing

Andreas C. Wegerif
Marketing Coordinator

ASSOCIATION OF GERMAN COASTAL SHIPPERS

Dr. Hans Jürgen Stöcker
Chairman

FREE AND HANSEATIC CITY OF HAMBURG

Dr. Dirk Kersten Behrendt
Head of Port and Shipping Division
State Ministry of Economic Affairs

Gunther Bonz
Director of Port Planning

HAMBURG CHAMBER OF COMMERCE

Hartwig Serchinger
Head of Transport Department

September 21, 1993 - Hamburg, Germany

COMMITTEE OF GERMAN SEAPORT FREIGHT FORWARDERS

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President

Kurt-Jürgen Schimmelpfeng
Executive Director

Wolfgang Piehler
Board Member

Robert Volkl
Board Member

Hans J. Willam
Board Member (Danzas GMBH)

GERMAN SHIP OWNERS ASSOCIATION

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ISETEC (HAMBURG PORT CONSULTING DIVISION)

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Technical Specialist, ISETEC

HAPAG-LLOYD

Ulrich Kranich
Director, Operations Europe

September 22, 1993 - Bremen, Germany

FREE HANSEATIC CITY OF BREMEN MINISTRY FOR PORTS, SHIPPING AND FOREIGN TRADE

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Deputy Director

Uwe Will
Managing Director
Foreign Trade and Port Promotion

Michael Skiba
Foreign Trade and Port Promotion

PORT OPERATING COMPANY OF BREMEN/BREMERHAVEN

Bengt van Beuningen
Public Relations Manager

GUTERVERKEHRSZENTREN (GVZ) BREMEN

Ralf Langhorst
Managing Director GVZ and Langhorst Co.

GERMAN INTERNATIONAL TRADE AND TRANSPORTATION ACADEMY

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Dean of Studies

Manfred Winkler
Dean of Seminars

Rolf Achnitz
Instructor

September 23, 1993 - Bonn, Germany

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Director of Combined Transport
and Intermodal Affairs

DEUTSCHE BUNDESBAHN

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Cologne Intermodal Terminal

September 24, 1993 - Frankfurt, Germany

TFG TRANSFRACHT

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Marketing and Communications

Matthias Malicke
Manager National Sales

TRANSFRACHT COMBI MARITIME (TCM)

Jos Van den Wyngaert
Director
TCM Benelux

Daniel Müller
Sales Manager

INTERCONTAINER—INTERFRIGO (ICF)

Bryan A. Stone
Market Research Manager
Basel, Switzerland

Appendix II
Facilities Visited

ECT-Delta Combined Intermodal Terminal
Rotterdam, The Netherlands

Port of Rotterdam
Rotterdam, The Netherlands

Port of Amsterdam
Amsterdam, The Netherlands

Port of Hamburg
Hamburg, Germany

Port of Bremen
Bremen, Germany

Combined Truck, Rail, Port and Industrial Terminal
(Guterverkehrszentren—GVZ)
Bremen, Germany

Truck-Rail Intermodal Container Facility
Cologne, Germany

Truck-Rail Intermodal Container Facility
Frankfurt, Germany

Appendix III
European Intermodal Policy Review: Questionnaire

1. What is the process by which **existing and emerging European intermodal transportation policies, systems, technologies, and facilities are developed and implemented**?

   Which of these have **potential application, and/or offer examples** for the United States under similar intermodal transportation development circumstances and issues?

2. What is the **working relationship between the private sector and government** (local, regional, national, and European Community) in the development and implementation of intermodal transportation policies and projects?

3. How were **conflicting issues resolved** during the development and implementation of European Commission policies and regulations affecting intermodal transportation?

   What are the **similarities** between Europe's local, national, European Community-wide, and international actions, and the United States' regional, state, national, and NAFTA?

4. How have the **following issues helped shape policy development in intermodal transportation**?
   a. environmental concerns and energy conservation;
   b. physical and operational constraints;
   c. economic development goals.

   Is there a relationship between these transportation system issues and European **professional training and education programs**, including internships and apprenticeship programs? In what way?

5. How are the European Commission's **intermodal policies and projects**, both short- and long-term, **adhered to at different levels of government** (local, state, national) and by the private sector?

6. What are the **mechanisms for resolving differing interests** of the individual transportation modes when establishing efficient intermodal systems, including those now in operation and in the future?

7. **Based on your experiences** thus far in developing and implementing European intermodal policies and practices, what are the **key changes you might make** if you had the opportunity to do it over again?

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Special acknowledgement is due all the European transportation ministries, contractors, and researchers for their gracious hospitality and for generously sharing their time and expertise with the scanning team. In addition, the following persons helped arrange specific meetings, facility visits, and other supportive activities:

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Direction Generale Des Transport, European Commission

Bernd H. Moldt, Director, Central Division Marketing
Port of Hamburg

Jean-Luc Renaus, European Market Development
Burlington Northern Railroad

Issac Shafran, Director of Transportation Engineering
Louis Berger International

Eduard Sjerp, Counselor for Transportation
Royal Netherlands Embassy

Bryan Stone, Market Research Manager
Intercontainer—Interfrigo (ICF)

Andreas Wegerif, Marketing Coordinator
Port of Hamburg

Bernd Wesp, Manager, Marketing and Communications
TFG Transfracht

Uwe Will and Michael Skiba, Foreign Trade and Port Promotion
Port Operating Company of Bremen/Bremerhaven

Henry Vlasfled, Senior Advisor, International Affairs
The Netherlands Ministry of Transport, Public Works and Water Management

Ferdinand von Peter, Director of Combined Transport and Intermodal Affairs
German Federal Ministry of Transport

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